Troubleshooting Guide

Apple **TechStep**

For the Macintosh Classic, SE,
SE/30, II, IIx, IIcx, and Apple SCSI
Hard Disk Drives

Radio and television interference

The equipment described in this manual has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his own expense.

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Contents

CPU Tests

CPU Tests explains how you can use Apple
TechStep™ and the *CPU Tests, Volume 1* ROM
pack to troubleshoot the Macintosh® Classic®,
SE, SE/30, II, IIx, and IIcx computers. Test de-
scriptions, instructions for each test, test avail-
ability, and cable requirements are in this
chapter.

Introduction

The *CPU Tests, Volume 1* ROM pack tests the following Macintosh computers:

- Macintosh Classic, SE/30, and SE

- Macintosh II, IIx, and IIcx

This ROM pack also tests the following peripherals (when installed on or attached to one of the above Macintosh computers):

- Apple SuperDrive™, Apple 3.5 Drive, and Macintosh 800K floppy disk drives (internal or external)

- Macintosh II Video Card (4- and 8-bit versions)

- Macintosh II High-Resolution Video Card (4- and 8-bit versions)

- Macintosh II Monochrome Video Card (1-bit)

- Apple Two-Page Monochrome Monitor Video Card (4- and 8-bit versions)

- Apple Macintosh Portrait Display Video Card (4- and 8-bit versions)

Troubleshooting Hints

- If the computer you're troubleshooting won't boot:

    - On a Macintosh II, IIx, or IIcx: check the battery voltage (II and IIx) or power-up voltage (IIcx). A bad battery or power supply will prevent power-on.

    - Run all Logic tests, the Drive test, and, if applicable, the Video test.

- If you experience unexpected problems during testing, remove non-Apple expansion cards, disconnect peripherals, and re-test. When the computer passes or you have repaired it, reinstall the non-Apple expansion cards and reconnect peripherals one at a time and retest. Repeat the install-and-test process until all expansion cards are installed and the computer passes all tests.

- If you think you know what the problem is and would like to verify that diagnosis, skip to the individual test for that problem. However, if the message **Check prior UUT functions** appears, return to the Home menu and run all tests in order.

- If you don't know what's wrong, it's a good idea to attach all cables before starting, so that you can run ALL Logic tests. If you want to run a specific test, refer to Table 1-1, Test Availability and Cables, and attach only the cables for that test.

Things to Remember

- Use the AC adapter for extended testing (hard disk tests or looping tests, for example). Using the AC adapter prolongs battery life and reduces the risk of losing power at a crucial time.

- Table 1-1, Test Availability and Cables, provides a matrix of the tests and functions for each model of Macintosh computer and the cables required for those tests and functions. This table provides a quick reference to setting up Apple TechStep.

- Connecting all the interface cables allows you to run all the tests and use all the functions in the *CPU Tests, Volume 1* ROM pack.

- The audio port on the Macintosh disables the internal speaker when you connect the audio cable. To hear the tones, leave the audio cable disconnected from the Macintosh until the Test Manager is active. See "Macintosh Test Manager."

- Mark both ends of the mini DIN-8 serial cable that is connected to Apple TechStep's modem port. Also mark the ADB cable connected to the Apple TechStep ADB 1 port. Marking the ends of the modem and ADB 1 cables will allow you to tell at a glance which Apple TechStep ports are connected to which Macintosh computer ports. (For proper communication with the UUT Test Manager, Apple TechStep requires you to connect the modem ports. When testing Macintosh computers with only one ADB port [such as the Macintosh Classic], use the ADB 1 port on Apple TechStep.)

- Be sure to read the Release Notes (at the end of this chapter) for additional **important** information.

Macintosh Test Manager

Most Apple TechStep CPU tests require the Macintosh computer to be in Test Manager mode. The Test Manager is a set of built-in ROM commands in the Macintosh computer. The Test Manager allows an external device to communicate with the Macintosh computer via the serial port.

Test Manager Entry

A catastrophic failure during the CPU power-on self-tests drops the CPU into Test Manager mode. When a CPU enters the Test Manager, it often (but not always) displays the "sad Macintosh" icon. The SE/30 and the Macintosh II family usually sound the four-note failure chimes as well. If the CPU does not enter the Test Manager during power-on self-tests, you must switch off the computer and either 1) use the Apple TechStep tstMd entry feature or 2) use the manual Test Manager entry method described below.

Automatic Test Manager Entry
Instructions for using Apple TechStep's tstMd function to place the CPU in Test Manager mode are under "tstMd – Test Manager Mode" in "CPU Tests and Functions."

Manual Test Manager Entry

A severe SCSI or serial interface failure may require that you enter the Test Manager manually. To place the CPU in Test Manager mode manually:

1. Switch on the computer.

2. Wait until the built-in RAM tests have completed and the cursor arrow appears on the screen (5 to 10 seconds). Press the non-maskable interrupt (NMI) switch.

Test Hierarchy

The Apple TechStep menus list the CPU tests in order of priority. The most basic functions appear first and should be tested first. For example, the ROM Checksum is the first individual logic test (after ALL Logic) because the ROMs contain the Test Manager, without which none of the later tests run. Similarly, the RAM functions appear next because most tests store data or instructions in RAM—if RAM is faulty, tests further down the hierarchy will not run or may give incorrect results.

Prior Function Failures

If you run tests out of sequence, the tests may fail because of a problem with an untested prior function. This type of failure is called *prior function failure.* There are five types of prior function failures:

- **Lost comm w/UUT**

  Lost comm w/UUT indicates that the Test Manager has stopped responding to commands from Apple TechStep.

Loss of Test Manager communication results from a defective serial interface chip on the UUT, a power failure, or a loose interface cable. Check power and cable connections, reboot the UUT, and test again.

■ **UUT timed out**

UUT timed out indicates that Apple TechStep downloaded the test to the UUT RAM, but the UUT failed to otherwise respond. When the time allowed for the response expired, Apple TechStep terminated the test.

A RAM problem or a serious fault with the UUT may produce the **UUT timed out** message. Run prior tests and test again.

■ **Invalid result**

Invalid result means the test ran but the failure code returned by the UUT does not make sense or is invalid.

Invalid results may be the result of a problem with the previous function in the test hierarchy. Run ALL Logic tests in nonlooped mode. (Tests in nonlooped mode will stop after the first failure.) If prior tests pass and the same test fails again with the same message, the function you originally tested is probably faulty.

■ **Failed to init**

Failed to init means the test failed to initialize within the UUT.

Failed to init may be the result of a problem with the previous function in the test hierarchy. Run All Logic tests in nonlooped mode. (Tests in nonlooped mode will stop after the first failure.) If prior tests pass and the same test fails again with the same message, the function you originally tested is probably faulty.

■ **Undefined error**

Undefined error means Apple TechStep cannot identify the error.

Intermittent failures unrelated to the current test can cause undefined errors. Run ALL Logic tests in nonlooped mode. (Tests in nonlooped mode will stop after the first failure.) If prior tests pass and the same test fails again with the same message, the function you originally tested is probably faulty.

Prior Function Failures in Looped Mode
If Apple TechStep encounters a prior function failure during looping, testing will stop. A **?** appears in the log at the point where the prior function failure occurred.

```
ROM  A  Run   Err  1
ROMck  1      1
RAMsz  2MB
SCC    1      -    ?
```

Figure 1-1   **Prior Function Failure Log Entry**

Connecting Apple TechStep

This section tells you how to connect a Macintosh computer to an Apple TechStep fitted with the *CPU Tests, Volume 1* ROM pack.

▲ Caution

Always switch off Apple TechStep and the Macintosh before you connect cables.

Connecting Cables

Figure 1-2 and Figure 1-3 show cable connections. Connecting all cables allows you to run all tests and functions. Refer to Table 1-1, Test Availability and Cables, if you wish to use only some tests and/or functions.
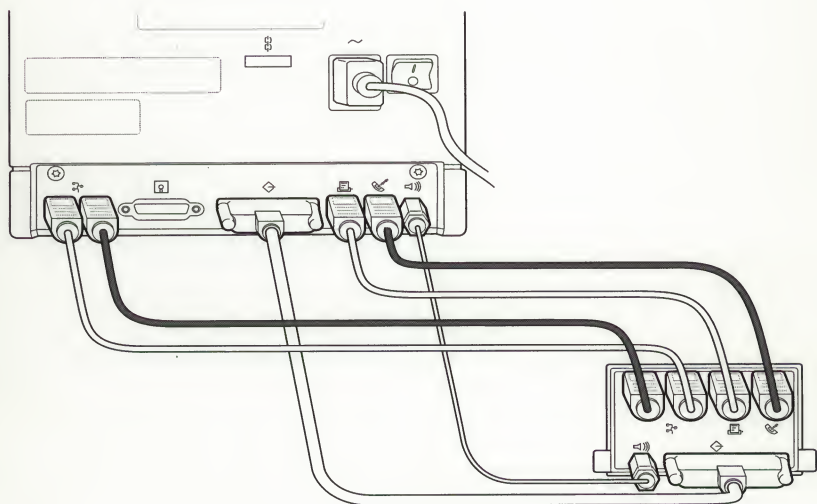
Figure 1-2   **Connecting to a CPU**

For CPUs with an internal hard drive, connect the cables as in Figure 1-2. Use the Apple TechStep SCSI cable to connect Apple TechStep to the computer SCSI port.

For CPUs without an internal hard drive, you must switch on the Apple TechStep SCSI termination feature. Refer to "SCSI Term – SCSI Termination On/Off" for instructions.
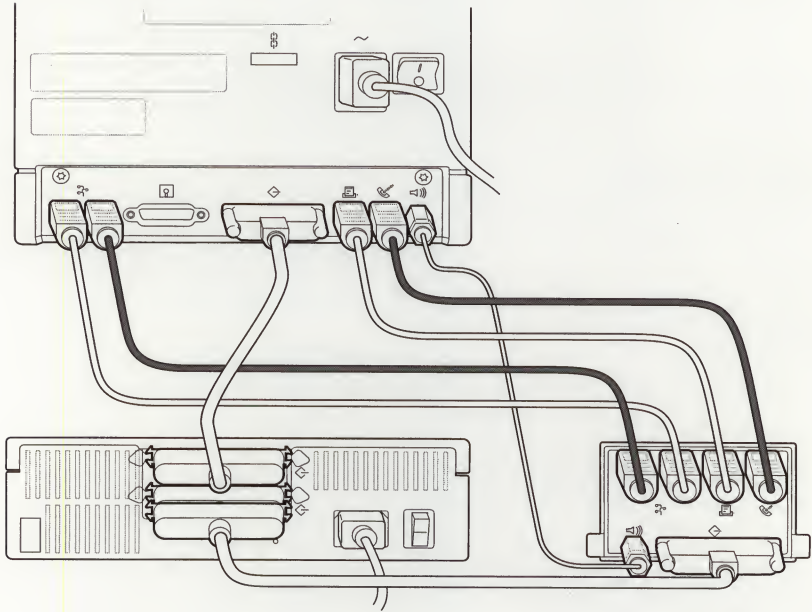
Figure 1-3   **Connecting to a CPU and External SCSI Devices**

For CPUs with external SCSI devices, connect the cables as in Figure 1-3. Use a standard SCSI system cable to connect Apple TechStep to the last SCSI device. The last device should have an Apple SCSI Cable Terminator. If you don't have a SCSI terminator, switch on the Apple TechStep SCSI termination feature. Refer to "SCSI Term – SCSI Termination On/Off" for instructions.

**Tips for Connecting
Cables**

- Match the interface port icons on the Apple TechStep port pack and the rear panel of the UUT.

- Mark both ends of the mini DIN-8 serial cable that is connected to Apple TechStep's modem port. Also mark the ADB cable connected to the Apple TechStep ADB 1 port. Marking the ends of the modem and ADB 1 cables will allow you to tell at a glance which Apple TechStep ports are connected to which Macintosh computer ports. (For proper communication with the UUT Test Manager, Apple TechStep requires you to connect the modem ports. When testing Macintosh computers with only one ADB port [such as the Macintosh Classic], use the ADB 1 port on Apple TechStep.)

- On systems with one ADB port (Macintosh Classic), connect the ADB cable to the ADB 1 port on Apple TechStep.

- You may find the cables easier to handle if you use cable ties to bundle them together.

Test or Function	SE	Classic	SE/30	II	IIx	IIcx	Cable(s)[2]
PowrS	✓	✓	✓	✓	✓	✓	ADB[1]
Batt.				✓	✓		ADB
PwUpV						✓	ADB
tstMd	✓	✓	✓	✓	✓	✓	Modem, SCSI, ADB[1]
Logic							
ALL	✓	✓	✓	✓	✓	✓	All cables[1]
ROMck	✓	✓	✓	✓	✓	✓	Modem
BsRAM	✓	✓	✓	✓	✓	✓	Modem
RAMsz	✓	✓	✓	✓	✓	✓	Modem
Buses	✓	✓	✓	✓	✓	✓	Modem
SIMMs	✓		✓	✓	✓	✓	Modem
RAM		✓					Modem
Video			✓				Modem
VIA	✓	✓	✓	✓	✓	✓	Modem
Clock	✓	✓	✓	✓	✓	✓	Modem
P/RAM	✓	✓	✓	✓	✓	✓	Modem
SCC	✓	✓	✓	✓	✓	✓	Modem, Printer
SCSI	✓	✓	✓	✓	✓	✓	Modem, SCSI
SWIM	✓	✓	✓	✓	✓	✓	Modem
FPU			✓	✓	✓	✓	Modem
Sound	✓	✓	✓	✓	✓	✓	Modem, Audio
ADB	✓	✓	✓	✓	✓	✓	Modem, 2 ADB[3]
Video				✓	✓	✓	Modem
Drive	✓	✓	✓	✓	✓	✓	Modem
Verify CPU ID	✓	✓	✓	✓	✓	✓	Modem
Power On CPU				✓	✓	✓	ADB
Power Off CPU				✓	✓	✓	Modem, ADB
SCSI Term [ON/OFF]							None
SCSI Functions							
SCSI Term Powr	✓	✓	✓	✓	✓	✓	SCSI
SCSI Term Chk	✓	✓	✓	✓	✓	✓	SCSI
SCSI Bus Scan	✓	✓	✓	✓	✓	✓	Modem, SCSI
AplTS SCSI#:	✓	✓	✓	✓	✓	✓	None
SCSI Bus Reset	✓	✓	✓	✓	✓	✓	SCSI

Table 1-1   **Test Availability and Cables**

Notes for Table 1-1

1. Connect the Macintosh Classic ADB port to the ADB 1 port on Apple TechStep.

2. For automatic Test Manager entry, connect a SCSI cable, a serial cable (modem port to modem port), and one ADB cable. These three cables are in addition to the cable(s) that the test(s) require. Use a SCSI terminator or the Apple TechStep SCSI Term function to properly terminate the SCSI bus. Refer to "SCSI Bus Termination" for information on proper SCSI bus termination.

3. The Macintosh Classic allows only one ADB cable. Connect the cable to the ADB 1 port on Apple TechStep.

SCSI Bus Termination

Table 1-2 illustrates the proper termination of the SCSI bus when you use Apple TechStep. The table assumes that SCSI termination on an internal hard disk functions correctly.

Internal Hard Disk	External SCSI Devices	Termination Status	Apple TechStep SCSI Term feature
Yes	No	Terminated	OFF
Yes	Yes	Terminated	OFF
No	No	Unterminated	ON
No	Yes	Terminated	OFF

Table 1-2   **SCSI Bus Termination**

CPU Tests and Functions

Introduction

This section describes the Apple TechStep tests and functions in the *CPU Tests, Volume 1* ROM pack. The section includes:

■ What each test or function does

■ Test pass/fail criteria

■ How to perform the test or function

Some tests are not available on all computer systems. The test descriptions on the following pages list applicable computers.

Some tests have limitations to the range of information that Apple TechStep provides. Test limitations are included.

Table 1-1, Test Availability and Cables, lists tests for each CPU and the minimum cable(s) for each test.

All test descriptions assume that you selected the correct CPU type and that Apple TechStep displays the menu page that contains the test. If you need assistance in navigating menus, see "Using the Keypad and Menus" in Chapter 2, Getting Acquainted, in the *Apple TechStep User's Guide*.

Descriptions

PowrS – Power Supply Voltage
Cable needed: ADB

PowrS measures and displays the voltage on the +5 volt bus that flows through pin 3 (Power) of the ADB port. The voltage ranges from 0 to 5.5. Apple TechStep indicates whether the power supply voltage is OFF, LO, OK, or HI, as follows:

OFF – 0 to 1.99 volts
LO – 2.0 to 4.79 volts
OK – 4.8 to 5.25 volts
HI – 5.26 volts and above

Figure 1-4 shows a sample power supply voltage measurement.

```
Classic
Power Supply
Actual=5.00V:OK
Normal=>4.80V
```

Figure 1-4   **Power Supply Voltage**

To perform a power supply voltage measurement:

1. Switch on the computer.

2. Select **PowrS** from the menu.

The voltage should be approximately 5.00 V and the power-on status should be ON.

If the power supply status is OFF, verify that the power cord is secure. If the power supply status is still OFF, replace the power supply.

If the power supply status is LO or HI, replace the power supply.

Batt. – Battery Voltage (II and IIx only)
Cable needed: ADB
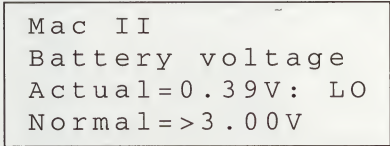
This function measures and displays the voltage of the lithium batteries on the Macintosh II and IIx logic boards. Apple TechStep takes the measurement on pin 2 (power-on/) of the ADB port. The voltage ranges from 0 to 9.0. Apple TechStep indicates whether the batteries are OK, LO, or HI, as follows:

LO – 0 to 2.99 volts
OK – 3.0 to 7.49 volts
HI – 7.5 volts or above

Figure 1-5 shows a sample battery voltage measurement.

```
Mac II
Battery voltage
Actual=0.39V:  LO
Normal=>3.00V
```

Figure 1-5   **Battery Voltage**

To perform a battery voltage measurement, select **Batt.** from the menu. (The Macintosh computer can be on or off.)

❖ Note   The battery voltage measurement is only for the Macintosh II and IIx.

PwUpV – Power-Up Voltage (IIcx only)

Cable needed: ADB

The Macintosh IIcx uses a trickle current from the power supply—instead of current from the batteries—to provide power to the power-on circuitry. This test displays the voltage of the trickle current at pin 2 (power-on/) of the ADB port. The voltage ranges from 0 to 5.0. Apple TechStep indicates whether the power supply trickle current voltage is OK, LO, or HI, as follows:

LO – 0 to 2.99 volts
OK – 3.0 to 6.59 volts
HI – 6.60 volts and above

Figure 1-6 shows a sample power-up voltage measurement.

```
Mac IIcx
Power up voltage
Actual=0.39V:  LO
Normal=>3.00V
```

Figure 1-6   **Power-up Voltage**

To perform a power-up voltage measurement:

1. Connect the power cord to the Macintosh IIcx and to a working wall outlet. (The Macintosh IIcx can be on or off when you measure power-up voltage.)

2. Select **PwUpV** from the menu.

If the power-up voltage is below 3.0 volts, verify that the power cord is secure. If the power-up voltage is still LO, replace the power supply.

❖ Note   The power-up voltage measurement is for the Macintosh IIcx only.
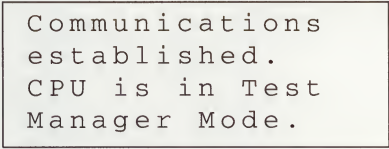
tstMd – Test Manager Mode
Cables needed: modem, SCSI, ADB

The tstMd (Test Manager mode) function allows you to force a Macintosh into Test Manager mode. If the UUT is a Macintosh II, IIx, or IIcx, tstMd will power on the computer automatically; the Classic, SE, and SE/30 require you to switch on the UUT after you choose **tstMd**.

To place the UUT in Test Manager mode:
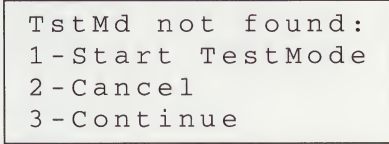
1. Select **tstMd** from the menu. Follow the instructions on the screen. When the process is complete, the screen in Figure 1-7 appears.

```
Communications
established.
CPU is in Test
Manager Mode.
```

Figure 1-7 **Communications Established**

If you forget to choose **tstMd**, you have a second chance: If the test you chose requires that the UUT be in Test Manager mode, the test will check for Test Manager communication before starting. If the test cannot communicate with the Test Manager, the test will prompt you as in Figure 1-8.

```
TstMd not found:
1-Start TestMode
2-Cancel
3-Continue
```

Figure 1-8 **Test Manager Not Found**

Press *1* to invoke the Test Manager, *2* to return to the menu, or *3* to attempt the test without the Test Manager.

Logic – Logic Tests

Cables needed: To run ALL Logic tests, con-
nect all cables (modem, printer, SCSI, audio,
ADB 1, and ADB 2 [the Macintosh Classic
computer has no ADB 2]). For individual tests,
Table 1-1, Test Availability and Cables, shows
the cables you need.

The Logic tests verify operation of the circuitry
on the logic board. (Apple TechStep treats the
Macintosh Classic memory expansion card as
an extension of the logic board.) From the
Logic submenu you can choose **ALL** to run all
the Logic tests in sequence, or you can choose
individual Logic tests.

To perform Logic tests:

1. Select **Logic** from the menu.

2. If you want the test(s) to run in looped
   mode, press *loop ⌘.

3. Select **ALL** or an individual test.

ALL – All Logic Tests

Cables needed: all cables (modem, printer,
SCSI, audio, ADB 1, and ADB 2 [the Macintosh
Classic computer has no ADB 2])

ALL performs all the Logic tests below.

❖ Note   In looping mode, ALL Logic tests will continue
to run even if errors occur. In nonlooping
mode, testing stops at the first error.

ROMck – ROM Checksum

Cables needed: modem

ROMck performs a checksum of the system
ROM. Figure 1-9 shows a sample test.

```
MacIIcx
ROM Checksum
Test PASSED
```

Figure 1-9 **ROM Checksum Test**

The test will fail if the calculated checksum does not match the checksum in the Macintosh ROMs. This test cannot identify individual ROM failures.

To isolate a faulty ROM on a Macintosh II or SE, you must exchange one ROM and rerun the ROMck test. Continue this exchange-and-test process until the test passes.

BsRAM – Base RAM (0-33K)
Cables needed: modem

BsRAM tests the first 33K of RAM. The Macintosh uses this area of memory for system initialization code and microprocessor stack, traps, and vectors. Apple TechStep requires portions of the first 16K of RAM to run many tests.

The sequence begins by testing the 17K of RAM that follows the first 16K. If this block of RAM tests OK, the test makes a copy of the contents of the first 16K of RAM and tests the first 16K. If the first 16K of RAM passes, the test restores the contents of the first 16K of RAM and the BsRAM test passes. Figure 1-10 shows a sample test.

```
Classic
Base RAM (0-33K)
Test PASSED
```

Figure 1-10 **Base RAM Test**

If Apple TechStep detects a failure, the message **Test FAILED** displays, followed by **Press 0 for info**. If you press *0*, the test identifies the bad DRAM SIMM or module.

Figure 1-11 shows sample failure results for the various CPUs. The **x** indicates the faulty DRAM SIMM or module. A **?** indicates a RAM location not tested by the BsRAM test.

Macintosh II, IIx, and IIcx

```
Mac  II
RAM    8MB
       ????  ||x|
Bank:  B      A
```

Macintosh SE/30

```
MacSE30
RAM    2MB
      |x  ||  ??  ??
Simm1   2   3   4
```

Macintosh SE

```
Mac  SE
RAM    2MB
xSIMM1      SIMM2
 SIMM3      SIMM4
```

Macintosh SE with ROMs for Apple SuperDrive

```
Mac  SE
RAM    2MB
xSIMM1      SIMM2
 SIMM3      SIMM4
```

Macintosh Classic

```
Classic
RAM    2MB
 LgcBd     ?MemBd
?FrntSm    ?RearSm
```

Figure 1-11 **Base RAM Failure Info Screens**

Figure 1-12 illustrates the base RAM failure
info screens.

Macintosh SE

SIMM 1
SIMM 3
SIMM 2
SIMM 4

Macintosh SE/30

1
2
3
4
ROM
SIMM

RearSm
FrntSm
1 MB RAM
(Soldered)
SIMM
Jumper

With
SIMM
Installed

Without
SIMM
Installed

Classic Memory Expansion Card

Bank B   Bank A

Macintosh II/IIx

Bank B   Bank A
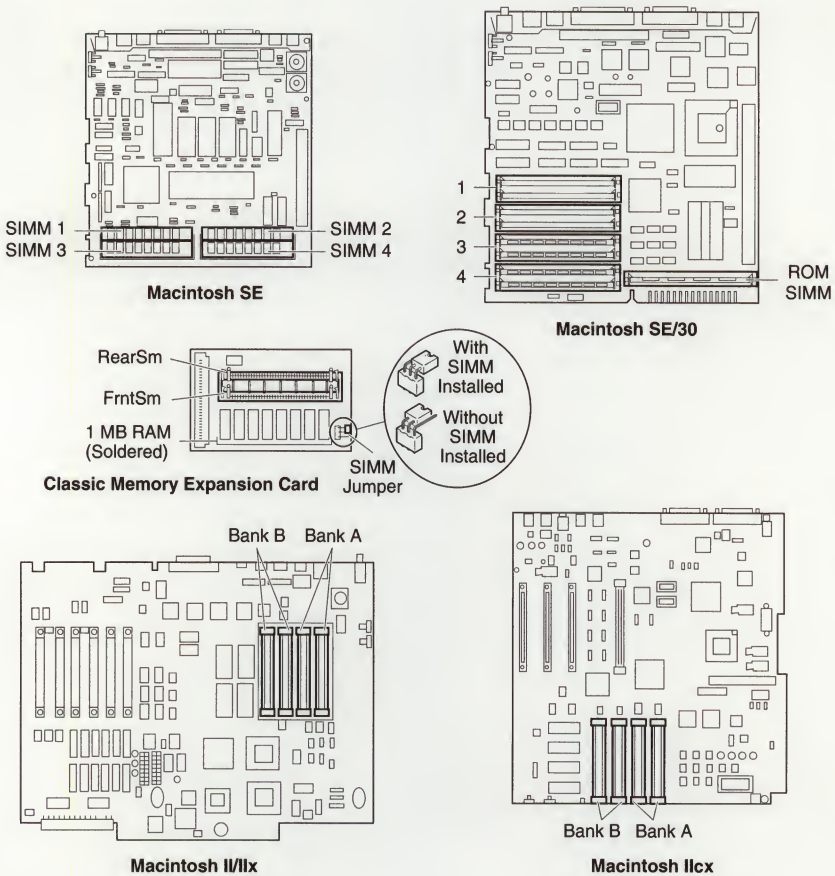
Macintosh IIcx

Figure 1-12 **SIMM and Module Locator**

RAMsz – RAM Size

Cables needed: modem

This test calculates and displays the amount of RAM in the Macintosh computer. On the Macintosh II, IIx, IIcx, and SE/30: the test finds the size of the largest DRAM in each bank and uses that number to determine the total RAM. (The test assumes that all four SIMMs in each bank are the same size.) On the Macintosh Classic and SE, the settings of two jumpers or resistors determine the reporting of RAM size. Figure 1-13 shows a sample RAM size display.

```
Mac  II
RAM  Size
   8 M B
```

Figure 1-13 **RAM Size**

On the Macintosh II, IIx, IIcx, and SE/30: the test also locates misconfigured or mismatched DRAM SIMMs.

Misconfigured appears if Bank A contains smaller SIMMs than Bank B. For example, if Bank A contains 256K SIMMs and Bank B contains 1 MB SIMMs, **Misconfigured** appears. Figure 1-14 shows a sample screen.

```
Mac  II
RAM  Size
   5  MB
Misconfigured
```

Figure 1-14 **Misconfigured Memory**

On the Classic and SE, the settings of two jumpers or resistors determine the reporting of RAM size. Therefore, Apple TechStep cannot detect misconfigurations. If the indicated

amount of memory is not what you expect, open the computer and verify that the SlMMs match the jumper or resistor settings.

Mismatchd or Bad appears if the SlMMs within a single bank are not all the same size or if some SIMMs are faulty. For example, if slot 1 contains a 1 MB SIMM and if slots 2, 3, and 4 contain 256K SIMMs, **Mismatchd or Bad** appears. The screen character **?** appears after the memory size because the test cannot calculate memory size with certainty when RAM chip(s) are faulty or mismatched. Figure 1-15 shows a sample screen.

```
Mac  IIx
RAM  Size
   1  MB?
Mismatchd  or  Bad
```

Figure 1-15 **Mismatched or Bad SIMMs**

Note that the test cannot distinguish between: 1) a faulty 1 MB SIMM in a bank of 1 MB SIMMs and 2) a good 256K SIMM in a bank of 1 MB SIMMs. Nor can the test distinguish a bad 256K SIMM from a misplaced 1 MB SIMM. You must visually inspect the SIMMs if **Mismatchd or Bad** appears.

Buses — Address and Data Bus Test
Cables needed: modem

This test checks the address and data buses. Figure 1-16 shows a sample test.

```
Mac  SE
Bus  Tests
All  tests  PASSED
```

Figure 1-16 **Address and Data Bus Test**

When complete, the test indicates that all tests passed or that the address or data bus test failed.

The address and data bus test may also catch memory problems. This test, however, does not specifically test for faulty RAM chips or SIMMs. A faulty DRAM, SIMM, or logic board can make the address and data bus test fail.

SIMMs or RAM – RAM Memory Test
Cables needed: modem

This test performs several read-and-write tests of the amount of RAM indicated by the RAM Size (RAMsz) test. The test is called **SIMMs** on all CPUs except the Macintosh Classic, which has non-SIMM RAM on its logic and memory expansion card—thus you see **RAM** on the Classic menu. The test detects catastrophic memory failures, missing or faulty SIMMs, or main logic board failure (Classic only). Figure 1-17 shows sample memory tests. The upper screen appears when the SIMMs test runs on a Macintosh SE/30, SE, II, IIx, or IIcx. The lower screen appears when the RAM test runs on a Macintosh Classic.

```
MacIIcx
SIMMs Test
Test PASSED
```

```
Classic
RAM test
Test PASSED
```
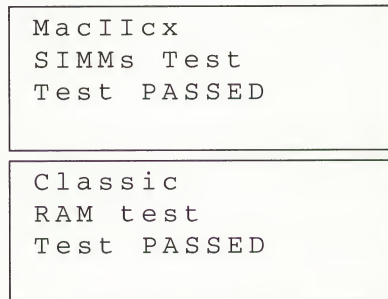
Figure 1-17 **SIMMs/RAM Test Run**

The activity indicator (in the upper-right corner of the display) will flash periodically during testing.

If a failure occurs, the message **Test FAILED** appears, followed by **Press 0 for info**. When you press *0*, the test identifies the bad DRAM SIMM or module.

Figure 1-11 shows sample failure screens for various CPUs. The **x** indicates the faulty DRAM SIMM or module.

Macintosh II, IIx, and IIcx

```
MacIIcx
SIMMs 64MB? Ms
      | | | |  | |x|
Bank: B       A
```

Macintosh SE/30

```
MacSE30
SIMMs 128MB? Ms
    |x | |  | |   | |
Simm1  2   3   4
```

Macintosh SE

```
Mac SE
RAM        5MB? Ms
xSIMM1        SIMM2
 SIMM3        SIMM4
```

Macintosh Classic

```
Classic
RAM        5MB? Ms
xLgcBd       MemBd
 FrntSm      RearSm
```

Figure 1-18 **RAM Failure Info Screens**

Ms will follow the memory size if Apple Tech-Step detects that the DRAM SIMMs are misconfigured. The memory size is Apple TechStep's best guess—because RAM is faulty, the test cannot accurately calculate memory size.

A **?** will follow the memory size if Apple Tech-Step detects that the DRAM SIMMs are mismatched or bad.

Figure 1-12 illustrates the above DRAM SIMM and module identifiers.

Video – Video RAM Test (SE/30 only)
Cables needed: modem

The video test verifies the 64K of soldered video RAM on the SE/30 logic board. Figure 1-19 shows a sample test.

```
MacSE30
Video RAM Test
Test PASSED
Video RAM: 64K
```

Figure 1-19 **Video Test**

When complete, the test indicates **PASSED** or **FAILED**.

VIA – VIA Test
Cables needed: modem

The VIA test examines the versatile interface adapters (VIA chips). Figure 1-20 shows a sample test.

```
MacIIcx
VIA Test
Test PASSED
```
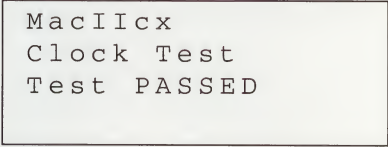
Figure 1-20 **VIA Test**

When complete, the test indicates **PASSED** or
FAILED.

Clock – Clock Test
Cables needed: modem

The clock test examines the real-time clock
(RTC) chip. Figure 1-21 shows a sample test.

```
MacIIcx
Clock Test
Test PASSED
```

Figure 1-21 **Clock Test**

When complete, the test indicates **PASSED** or
FAILED.
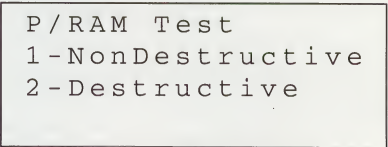
❖ Note   The Clock test clears the time and date. Use
the Control Panel to reset both.

P/RAM – Parameter RAM Test
Cables needed: modem

The parameter RAM test verifies the 256-byte
parameter RAM. The test has two modes—de-
structive and nondestructive. *Destructive
mode* erases all parameter RAM, including all
Control Panel and clock settings. *Nondestruc-
tive* saves the settings prior to testing and re-
stores the contents when testing is complete.
When you select the test, the following Op-
tions menu appears:

```
P/RAM Test
1-NonDestructive
2-Destructive
```

Figure 1-22 **Parameter RAM Test Type
Selection Dialog**

Figure 1-23 shows a sample Test Results screen for each type of parameter RAM test.

```
P / R A M   T e s t :
P a r a m e t e r   R A M
T e s t   P A S S E D
P / R A M   e r a s e d
```

```
P / R A M   T e s t :
P a r a m e t e r   R A M
T e s t   P A S S E D
P / R A M   n o t   e r a s e d
```
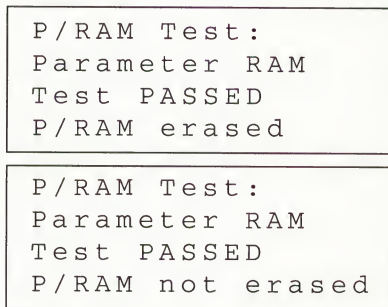
Figure 1-23 **Parameter RAM Tests**

Pressing *back* when you see the Test Results screen returns you to the P/RAM Options menu. Press *back* again to return to the Logic menu.

❖ Note   If Apple TechStep detects a failure, the *erased/not-erased* status of parameter RAM is indeterminant; therefore, the status of parameter RAM will not appear on-screen.

❖ Note   If the nondestructive parameter RAM test fails, the test may indicate that parameter data are corrupted.

❖ Note   If you select the destructive parameter RAM test, be sure to reset the mouse, sound volume, insertion point blink rate, RAM cache, menu blink rate, and auto-key repeat settings when you're finished.

❖ Note   When you run the parameter RAM test as part of an ALL Logic tests selection, Apple TechStep uses the nondestructive mode.

SCC – SCC Test

Cables needed: modem and printer

The SCC test checks the serial communications controller (SCC) chip in all modes, verifies that the serial interfaces can send (TxD line) and receive data (RxD line) correctly, and confirms that the handshake lines (HSKi, HSKo, and GPi) work. Figure 1-24 shows a sample test.

```
Mac II
SCC Test
Test PASSED
```

Figure 1-24 **SCC Test Results Screen**

The test will indicate which signal line of which port failed, or whether the SCC chip failed.

SCSI – SCSI Test

Cables needed: modem and SCSI

The SCSI test examines the small computer system interface (SCSI) chip in all modes and verifies that the SCSI bus can send and receive data correctly. Figure 1-25 shows a sample test.

```
Mac IIcx
SCSI Chip Test
Test PASSED
```

Figure 1-25 **SCSI Test Results Screen**

❖ Note   The SCSI test requires a SCSI cable in addition to the modem cable. You must connect the SCSI cable regardless of whether you want automatic Test Manager communication.

When complete, the test indicates **PASSED** or **FAILED**.

SWIM – SWIM/IWM Test

Cable needed: modem

The SWIM/IWM test determines whether the computer has an IWM controller chip (Integrated Wozniak Machine—for 800K drive systems) or SWIM controller chip (Sanders-Wozniak Integrated Machine—for 1.4 MB SuperDrive systems) and initializes the chip accordingly. Figure 1-26 shows a sample test.

```
Mac  II
SWIM/IWM  Test
Test  PASSED
IWM  installed
```

Figure 1-26 **SWIM/IWM Test Results Screen**

This test detects only catastrophic failures in the IWM/SWIM chips. The floppy drive test provides a more comprehensive test of the chip and the floppy disk drives.

When completed, the test indicates **PASSED** or **FAILED** and, if the test passes, will display which controller chip (IWM or SWIM) is installed.

❖ Note   Some SWIM failures cause Apple TechStep to indicate that the computer contains an IWM chip. If Apple TechStep indicates an IWM chip on any CPU other than the Macintosh II or SE, the SWIM chip may be defective.

FPU – FPU Test (SE/30, II, IIx, and IIcx only)

Cable needed: modem

The FPU test determines which floating-point unit (68881 or 68882) the computer has and verifies that the chip functions correctly. Figure 1-27 shows a sample test.

```
Mac II
FPU Test
Test Passed
68881 installed
```

Figure 1-27 **FPU Test Results Screen**

If the test passes, the test will indicate whether the FPU is a 68881 or 68882.

❖ Note   The FPU test is available for the Macintosh SE/30, II, IIx, and IIcx only.

Sound – Sound Test

Cables needed: modem and audio

The sound test verifies that the registers on the sound chip function correctly and that the UUT can read data from, and write data to, the sound chip. The test also measures the sound output for volume and frequency. Figure 1-28 shows a sample test.

```
Mac IIcx
Sound Test
Test PASSED
```

Figure 1-28 **Sound Test Results Screen**

When complete, the test indicates **PASSED** or **FAILED**.

ADB – ADB Test

Cables needed: modem and two ADB (one ADB for Classic)

The ADB test verifies that the Apple Desktop Bus™ transceivers, the portions of the VIAs that control ADB, the ADB line, and the ADB port are functional. Figure 1-29 shows a sample test.

```
Mac  II
ADB  Test
Test  PASSED
```

Figure 1-29 **ADB Test Results Screen**

The ADB test requires you to connect both ADB cables. (The Macintosh Classic requires only one cable. Connect the cable to the ADB 1 port on Apple TechStep.)

When complete, the test indicates **PASSED** or **FAILED**. If the test fails, it will indicate which Apple TechStep ADB port (1 or 2) detected the failure.

Video – Video Card Test (II, IIx, IIcx only)
Cable needed: modem

On Macintosh II family computers, the Video card test determines what video cards are installed and in what slots. The test displays a menu of cards. Select from this menu the video card you wish to test. Apple TechStep performs a memory test on the selected card.

Figure 1-30 shows a sample menu screen.

```
Which  slot/card?
1-M2Vid  4-
2-2page  5-
3-       6-
```
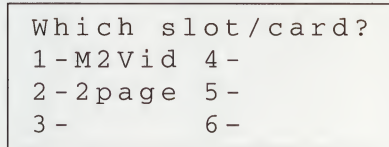
Figure 1-30 **Video Card Menu Screen**

The card slot number represents the NuBus slot that contains the video card. Number 1 is the NuBus™ slot on the left side of the CPU, the next slot is number 2, etc.

Apple TechStep tests the following video cards. Apple TechStep screens abbreviate the names of the video cards to five characters, as follows:

- M2Vid – Macintosh II Video Card

- HiRes – Macintosh II High-Resolution Video Card

- Mono – Macintosh II Monochrome Video Card

- 2page – Apple Two-Page Monochrome Monitor Video Card

- Prtrt – Apple Macintosh Portrait Display Video Card

❖ Note   Only Apple video cards have the identification
          information that Apple TechStep requires.
          Non-Apple cards do not appear in the menu.

          To perform a video card test:

          1. Select **Video** from the menu.

          2. If you would like the video test to run in
             looped mode, press *loop* ⏎.

          3. Select the video card you wish to test.

          If Apple TechStep detects a failure, the mes-
          sage **Test FAILED** appears, followed by **Press
          0 for info**. When you press *0*, the test dis-
          plays which video RAM chips are bad. If the
          defective memory is soldered to the video
          card, the message **Card Failure** appears. Fig-
          ure 1-31 shows a sample of each failure.

          Nonsocketed video RAM

```
Slot#:  1
Card:   M2Vid
CARD  FAILURE
```

          Socketed video RAM

```
Slot#:  1
Card: HiRes  256K
Bad  RAM  position
C1   C3
```

          Figure 1-31 **Video Card Test**

All the video cards—except the Macintosh Monochrome Video Card—have socketed video RAM. The RAM position codes for the video cards that have socketed video RAM are:

Macintosh II Video Card:
1B, 1C, 1D, 1E, 1G, 1H, 1G, 2H

Macintosh II High-Resolution, Portrait Display, and Two-Page Monochrome Monitor Video Cards:
1C, 2C, 3C, 4C, 5C, 6C, 7C, 8C

These codes are the horizontal-vertical coordinates of the VRAM sockets. The coordinates are silkscreened on the video card PCB.

❖ Note The video card tests are available for the Macintosh II, IIx, and IIcx only.

Drive – Floppy Disk Drive Tests
Cable needed: modem

The Drive tests determine which floppy drives are installed, identify each drive as 800K or 1.4 MB, and display a menu of drives. Use this menu to select the drive you wish to test. Apple TechStep verifies the drive's ability to read, write, and seek.

Apple TechStep tests 800K drives in 800K GCR (group-coded recording) format. Apple TechStep also tests the Apple SuperDrive in 800K GCR, 1.4 MB MFM (modified frequency modulation), or 720K MFM (MS-DOS®) format. When testing the Apple SuperDrive, Apple recommends testing all three formats.

The Drive test also provides a more thorough verification of the SWIM/IWM disk controller chip. Whereas the SWIM/IWM test provides only pass/fail results, the Drive test provides seventeen error results. Table 1-3, Drive Test Error Codes, lists the error codes.

Error codes 21 through 38 indicate a drive mechanism failure.

Error codes 42 through 54 can be a drive mechanism error or a media failure.

Error Code	Test
21	Motor control handshake test
22	Recalibrate to Track 00 test
24	Rapid head step test
26	Head overstep test
31	Mode change timing test
33	Motor speed change time test
34	GCR motor start timing test
35	GCR speed test
37	MFM low-capacity speed test
38	MFM high-capacity speed test
42	GCR format test
43	GCR read/write test
51	MFM 800K format test
52	MFM 1.4 MB format test
53	MFM 800K read/write test
54	MFM 1.4 MB read/write test

Table 1-3   **Drive Test Error Codes**

Verify CPU ID

Cable needed: modem

The CPU ID verification attempts to identify the CPU and displays the result. This test can be useful for identifying upgraded Macintosh computers—for example, from a Macintosh II to a IIx or from an SE to an SE/30. Figure 1-32 shows a sample.

```
Mac IIcx
Verify CPU ID
CPU is: MacIIcx

```

Figure 1-32 **Verify CPU ID Screen**

If the CPU identified does not match the type you selected, **MISMATCH** appears on line four, as Figure 1-33 shows.

```
Mac II
Verify CPU ID
CPU is: Mac IIx
    MISMATCH
```

Figure 1-33 **Mismatch CPU Screen**

If Apple TechStep can't identify the CPU, **Unknown** appears on line three, as Figure 1-34 shows.

```
Mac IIcx
Verify CPU ID
CPU is: Unknown
    MISMATCH
```

Figure 1-34 **Unknown CPU Screen**

❖ Note   The Verify CPU ID function requires that a considerable amount of the system function correctly. Faulty circuitry, such as RAM, can produce false Mismatch and Unknown errors.

Power On CPU (II, IIx, and IIcx only)
Cable needed: one ADB

On Macintosh II family computers, this function allows Apple TechStep to power on the computer.

❖ Note   The Power-on function is available on the Macintosh II, IIx, and IIcx only.

Power Off CPU (II, IIx, and IIcx only)
Cables needed: modem and one ADB

On Macintosh II family computers, this function allows Apple TechStep to power off the computer. **For Apple TechStep to use the Power Off CPU function, the UUT must be in Test Manager mode**.

❖ Note   The Power-off function is available on the Macintosh II, IIx, and IIcx only.

SCSI Term – SCSI Termination On/Off
Cable needed: SCSI

This function allows you to use Apple TechStep to supply an active termination path for the SCSI bus if no physical terminator is available (if you are working on a CPU with no hard disk, for example). You can also use SCSI Term to verify a faulty SCSI terminator.

❖ Note   The Apple TechStep SCSI Termination function requires the Macintosh or an external SCSI device to supply termination power. (The Macintosh Classic, SE, SE/30, II, IIx, and IIcx all provide termination power.)

❖ Note   When you switch Apple TechStep on, SCSI
Term defaults to OFF. This default prevents
Apple TechStep from masking problems with
the UUT SCSI bus termination.

Selecting **SCSI Term** will toggle the Apple
TechStep termination on and off. The termi-
nation status appears on-screen after the func-
tion name.

SCSI Functions

❖ Note   The SCSI functions are also in the *SCSI HD
Tests* ROM pack.

***SCSI Term Powr – SCSI Termination
Power Measurement***
Cable needed: SCSI

The SCSI Term Powr function measures and
displays the termination voltage on the SCSI
bus. The voltage ranges from 0 to 5.0 volts.
Apple TechStep indicates whether the termi-
nation power is LO, OK, or HI, as follows:

LO – 0 to 4.14 volts
OK – 4.15 to 5.24 volts
HI – 5.25 volts or above

A blown fuse or diode on the logic board can
cause insufficient voltage. Connecting or dis-
connecting the SCSI cable while the Macintosh
computer or an external device has power can
blow the fuse or diode.

Figure 1-35 shows a sample measurement.

```
Mac II
SCSI Term Power
Actual=4.76V: OK
Normal=>4.16v
```

Figure 1-35 **SCSI Termination Power**

To measure the SCSI termination voltage:

1. Switch on all devices attached to Apple TechStep.

2. Select **SCSI Term Powr** from the menu.

❖ Note   To properly measure SCSI termination power, switch on all devices on the SCSI bus.

SCSI Term Chk – SCSI Termination Check
Cable needed: SCSI

This test checks the SCSI bus to see whether termination is correct. Figure 1-36 shows a sample test result.

```
MacIIcx
SCSI  Term  Check
Test  PASSED
```

Figure 1-36 **SCSI Termination Check**

To perform a SCSI termination check:

1. Switch on all devices attached to Apple TechStep.

2. Verify that the Apple TechStep SCSI Term function is OFF. (If the Apple TechStep SCSI Term function is on, SCSI Term Chk will pass.)

3. Select **SCSI Term Chk** from the menu.

The test indicates **PASSED** or **FAILED**. If the check fails, verify the SCSI termination. (Internal SCSI hard disk drives should have terminator resistor packs. If external SCSI devices are attached, the last device on the daisy chain should have an external Apple SCSI Cable Terminator.

❖ Note   To check SCSI termination, switch on all de-
         vices on the SCSI bus.

☛ Tip   If you must terminate the SCSI bus for testing
         purposes only, switch on the Apple TechStep
         SCSI termination feature. See "SCSI Term –
         SCSI Termination On/Off."

SCSI Bus Scan
Cable needed: SCSI

The SCSI Bus Scan examines the SCSI bus,
builds a table of SCSI devices, and displays a
menu of these devices, as Figure 1-37 shows.

```
SCSI  Bus  Scan
TS=6;  devices  at
ID#s:  0-------
Info:  Press  ID#
```

Figure 1-37 **SCSI Bus Scan**

In Figure 1-37, **TS** indicates the current SCSI ID
of Apple TechStep. The SCSI IDs of SCSI de-
vices appear on the third line. To display in-
formation about a device, press the number of
the device.

```
ID#0  ROMv:2.30
CONNER  DISK
SR#E0C4XW
CP3040A-40mb-3.5
```

Figure 1-38 **SCSI Device Information**

Figure 1-38 shows a sample SCSI device information screen. If the device is a hard drive, Apple TechStep displays the ROM version, manufacturer, serial number (not available for all drives), product number, and drive size (not available for all drives). If the device is an Apple product, an Apple (🍎) appears in the first position of line 2.

❖ Note There are two types of SCSI device: initiators and targets. Initiators can initiate messages as well as receive and respond; targets can only receive and respond. The Macintosh computer and Apple TechStep are initiators; hard disks, printers, CD ROMs, scanners, and other peripherals are targets.

The SCSI Bus Scan shows only SCSI target devices. Initiators, such as the Macintosh computer and Apple TechStep, do not appear on the SCSI Bus Scan screen. If you choose a SCSI ID number that an initiator occupies or that doesn't correspond to a device, the Dialog screen in Figure 1-39 appears.

```
NO  SCSI  TARGET
DEVICE  FOUND  AT
THAT  SCSI  ID#
(Press  BACK)
```

Figure 1-39 **No SCSI Target Device Found Dialog Screen**

❖ Note Before you run a SCSI Bus Scan of a chain that includes a switched-on Macintosh computer, place the Macintosh in Test Manager mode. (If the Macintosh computer is not in Test Manager mode, the computer could send commands on the SCSI bus while tests are running and thus invalidate results.)

AplTS SCSI #: – Set Apple TechStep SCSI ID

Cables needed: none

In order to talk on the bus without causing data collisions, every device on a SCSI bus must have a unique SCSI device address (ID). Apple TechStep assigns itself a default SCSI device address of 6 whenever you switch on Apple TechStep. If another device on the SCSI bus already has address 6, use AplTS SCSI# to change the Apple TechStep address to any other legal SCSI address (0 – 7).

Figure 1-40 shows a sample screen.

```
Apple TechStep
SCSI ID # is: 6
Enter new ID #,
↓=accept;bk=cncl
```

Figure 1-40 **Setting the TechStep SCSI ID**

Enter the new ID number and press the *down* arrow (↓). This ID will remain the default ID number until you switch off Apple TechStep. (Changing the active ROM pack does not affect the setting.) Switching off Apple TechStep resets the SCSI ID number to 6.
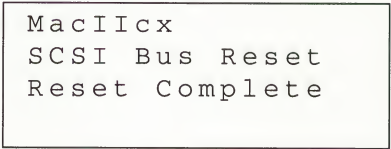
❖ Note   The factory sets every Macintosh computer to SCSI address 7, so if you connect Apple Tech-Step to a CPU, do not assign address 7 to Apple TechStep.

SCSI Bus Reset

Cable needed: SCSI

This function resets all devices on the SCSI bus. Resetting the SCSI bus places the bus in a power-up state.

Figure 1-41 shows a sample screen.

```
MacIIcx
SCSI Bus Reset
Reset Complete
```

Figure 1-41 **SCSI Bus Reset**

Release Notes

Test Manager

■ If the system you are testing has an Apple Display Card 4•8, 8•24, or 8•24GC: disconnect the video cable before you switch on the UUT. Otherwise, the UUT will fail to enter Test Manager mode. (This caution applies only if the monitor connected to the Apple Display Card is the primary monitor in the Monitor area of the Macintosh Control Panel.)

■ Third-party products—such as accelerator cards, network cards, graphics cards, hard disk arrays, etc.—can cause difficulty in entering the Test Manager. If you can't establish communication with the Test Manager, remove non-Apple products.

■ On third-party video cards, Apple recommends that you disconnect the video cable from the video card. Even though no monitor is attached, the wiring of third-party cables may falsely indicate the presence of a monitor.

■ The Test Manager on the Macintosh SE and Classic does not generate tones when activated, unlike the Test Managers on the Macintosh SE/30, II, IIx, and IIcx. When entering the Test Monitor on a Macintosh SE or Classic, watch the computer screen or Apple TechStep to verify communication with the Test Manager.

Batt.

The Macintosh II and IIx have two 3-volt batteries that produce 6 volts total. The Macintosh II and IIx power-on circuitry requires only 3 volts to initiate a power-on sequence. However, if the battery voltage is 4.5 volts or below, the batteries may still prevent a power-on, even though Apple TechStep indicates the voltage is OK.

PwUpV

The Macintosh IIcx power-on circuitry requires only 3 volts to initiate a power-on sequence. However, if the power-up voltage is 4.0 volts or below, the power-up voltage may still prevent a power-on, even though Apple TechStep indicates the voltage is **OK**.

RAMsz

If the RAM size resistors/jumpers are incorrect on a Macintosh Classic or SE, the computer may fail to boot, but all RAM may pass the RAM test.

Video Card Test

At this time, Apple TechStep will not test the Macintosh Display Card 4•8, 8•24, and 8•24GC. If one of these cards is the primary video card in a Macintosh computer (check the Monitor area of the Control Panel), this card will prevent Test Manager entry (even manual entry). To prevent a Macintosh Display Card from interfering with Test Manager entry, disconnect the monitor cable from the card prior to testing.

ADB

The ADB test cannot detect a cursor that creeps to the corner of the display. If the cursor creeps to the corner, the ADB circuitry is faulty. Replace the logic board.

BsRAM and SIMMs

If the BsRAM test fails on a Macintosh SE with an original-version logic board that was upgraded with Apple SuperDrive ROMs, then the BsRAM and SIMMs tests will map SIMM failures incorrectly: When SIMM 1 is bad, an **x** appears next to SIMM 3; when SIMM 2 is bad, an **x** appears next to SIMM 4.

To identify this Macintosh SE configuration:

1. The original-version logic board uses resistors (or jumpers on a daughterboard) to identify system memory configurations. Revised and new SE logic boards use jumpers on the logic board.

2. Identify Apple SuperDrive ROMS by their part numbers: 342-0701 and 342-0702. Another way to identify Apple SuperDrive ROMs is by the presence on the logic board of a SWIM chip rather than an IWM.

If conditions 1 and 2 are present and the BsRAM test fails, then interpret the failure message according to the information in the introductory paragraph. If you continue to experience failures in the BsRAM test, replace SIMMs 1 and 2.

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Macintosh Troubleshooting Symptom/Action Tables

Macintosh Troubleshooting – Symptom/Action Tables contains symptom/action tables for using Apple TechStep to troubleshoot the Macintosh Classic, SE, SE/30, II, IIx, and IIcx.

Introduction

How to Use the Symptom/Action Tables

First find the symptom that most nearly describes the problem; then perform the first corrective action on the list. If the first corrective action does not fix the problem, go to the next action. If you replace a module and find that the problem remains, reinstall the original module before you proceed.

❖ Note   When instructed to replace the logic board, install the customer's DRAM and VRAM SIMMs on the exchange board.

Take-apart and adjustment procedures are in *Apple Service Technical Procedures for Macintosh Computers* and on the *Apple Service Source* CD-ROM.

Macintosh Classic, SE, & SE/30

System Problems
Computer does not power on, screen is black, and fan doesn't run

Action
1. Verify that the power cord is connected and the power switch is on.
2. Replace the power cord.
3. Use Apple TechStep to measure the power supply voltage. If the voltage is below 4.8, replace the power supply (SE and SE/30) or power/sweep board (Classic).
4. Replace the analog board (SE and SE/30).

Computer intermittently crashes or locks up

1. Make sure the system software is version 6.0.7 or later.
2. Make sure all software is known-good.
3. Run all the Apple TechStep Logic tests in looping mode. If the SIMMs test fails on an SE or SE/30, replace the faulty SIMM(s). If the RAM test fails on a Classic, replace the defective module or SIMM(s). If any other test fails, replace the main logic board.
4. Use Apple TechStep to measure the power supply voltage. Replace the power supply if the voltage is below 4.8.

Video Problems
Screen is dark; audio and drive OK

Action
1. Readjust the brightness.
2. Run all the Apple TechStep Logic tests. If the SIMMs test fails on an SE or SE/30, replace the faulty SIMM(s). If the RAM test fails on a Classic, replace the defective module or SIMM(s). If any other test fails, replace the main logic board.
3. Check the yoke cable connection.
4. Readjust the cutoff (Classic only).
5. Replace the power/sweep board (Classic) or the analog board (SE and SE/30).
6. Replace the video board (SE and SE/30).
7. Replace the CRT.

Screen is bright and audio is present, but no video information

1. Run all the Apple TechStep Logic tests. If the SIMMs test fails on an SE or SE/30, replace the faulty SIMM(s). If the RAM test fails on a Classic, replace the defective module or SIMM(s). If any other test fails, replace the main logic board.
2. Replace the power/sweep board (Classic) or analog board (SE and SE/30).
3. Replace the video board (SE and SE/30).

A single vertical/ horizontal line on screen

1. Replace the power/sweep board (Classic) or the analog board (SE and SE/30).
2. Replace the video board (SE and SE/30).
3. Replace the CRT.

Vertical/horizontal bars on screen

1. Run all the Apple TechStep Logic tests. If the SIMMs test fails on an SE or SE/30, replace the faulty SIMM(s). If the RAM test fails on a Classic, replace the defective module or SIMM. If any other test fails, replace the main logic board.
2. Replace power/sweep board (Classic) or analog board (SE and SE/30).

A white dot in center of screen

1. Check the yoke cable connection.
2. Replace the power/sweep board (Classic) or the analog board (SE and SE/30).
3. Replace the CRT.

Screen jitters

1. Move the computer away from electrical equipment that may cause interference.
2. Replace the power/sweep board (Classic) or the analog board (SE and SE/30).

Floppy
Drive Problems

Action

Audio and video OK, but internal drive does not work

1. If a known-good disk works, replace the faulty disk.
2. Run all the Apple TechStep Logic tests. If the SWIM or IWM (SE only) test fails, replace the main logic board.
3. Run the Apple TechStep Drive test on the faulty drive. If the test fails, replace the internal drive cable.
4. Replace the internal drive.
5. Replace the power supply.

Audio and video OK, but neither internal drive works (SE only)

1. Run all the Apple TechStep Logic tests. If the SWIM/IWM test fails, replace the main logic board.
2. Replace the power supply.

External drive does not work

1. If a known-good floppy disk works, replace the floppy disk.
2. Be sure the external drive is not near the power supply (the power supply is on the left side of the Macintosh computer).
3. Run all the Apple TechStep Logic tests. If the SWIM/IWM test fails, replace the main logic board.
4. Run the Apple TechStep Drive test on the external drive. If the test fails, replace the external drive.

Disk ejects; display shows icon with blinking X

1. Replace the disk with a known-good system disk.
2. Run the Apple TechStep Drive test. If the test fails, replace the drive.
3. Run all the Apple TechStep Logic tests. If a test fails, replace the main logic board.

Drive will not eject disk	1. Switch off the computer. Hold the mouse button down while you switch the computer on (to complete the eject cycle). 2. Eject the disk manually by pushing an opened paper clip into the hole beside the drive. 3. Run all the Apple TechStep Logic tests. If a test fails, replace the main logic board. 4. Run the Apple TechStep Drive test. If the test fails, replace the drive cable. 5. Replace the drive.
Drive will not eject disk completely	1. Eject the disk manually by pushing an opened paper clip into the hole beside the drive. 2. Switch off the computer. Hold the mouse button down while you switch the computer on (to complete the eject cycle). 3. Replace the drive.
Internal drive runs continuously	1. If a known-good disk works, replace the faulty disk. 2. Run the Apple TechStep Drive test. If the test fails, replace the drive. 3. Run all the Apple TechStep Logic tests. If any test fails, replace the main logic board.
Drive attempts to eject disk but doesn't	1. Reinsert the disk. 2. Eject the disk manually by pushing an opened paper clip into the hole beside the drive. 3. Replace the drive.
Disk will not insert completely	1. Eject disk manually by pushing an opened paper clip into the hole beside the drive. 2. Switch off the computer. Hold the mouse button down while you switch the computer on (to complete the eject cycle). 3. Replace the drive.

SCSI Probkems	**Action**
Internal hard drive will not work or spin; drive LED does not light,	1. Verify that the drive and all other SCSI connections and terminations are proper. 2. Run the Apple TechStep SCSI Bus Scan. If the scan can't find the hard drive, replace the hard drive power cable. 3. Replace the hard drive.
Computer works with internal or external SCSI device but not both	1. Verify that no external device has a SCSI address of 0 (internal hard drive address) or 7 (CPU address). Also verify that all SCSI devices have unique SCSI addresses. 2. Use the Apple TechStep SCSI Term Check to verify that SCSI termination is correct. If the check fails, replace the external terminator (if present). If the check still fails, replace the main logic board. 3. If an internal SCSI hard drive is installed, verify that termination resistors are installed.

Mouse and Peripheral Problems	**Action**
Cursor does not move	1. Reboot the system. 2. Check the mouse connection. 3. Clean the mouse. 4. If the mouse was connected to a keyboard, connect the mouse directly to an ADB port. If the mouse now works, replace the keyboard. 5. Run ALL Apple TechStep Logic tests. If the ADB test fails, replace the main logic board. 6. If the mouse does not work in either ADB port, replace the mouse.
Cursor moves, but clicking the mouse button has no effect	1. Run ALL Apple TechStep Logic tests. If the ADB test fails, replace the main logic board. 2. Replace the mouse.

No response to any key on the keyboard	1. Check the keyboard connection to the computer ADB port. 2. Run ALL Apple TechStep Logic tests. If the ADB test fails, replace main logic board. 3. Replace the keyboard cable. 4. Replace the keyboard.
Double-clicking will not open a volume or application	1. Locate and remove extra system files. 2. Use the Apple TechStep P/RAM test (destructive mode) to clear the parameter RAM. Restore the parameter RAM settings. 3. If mouse was connected to a keyboard, connect the mouse directly to an ADB port. If the mouse works, replace the keyboard. 4. Run ALL Apple TechStep Logic tests. If the ADB test fails, replace the main logic board. 5. If the mouse fails in an ADB port, replace the mouse.
Known-good ImageWriter will not print	1. Make sure the Chooser indicates the ImageWriter™ icon and the correct serial port. 2. Run ALL Apple TechStep Logic tests. If the SCC test fails, replace the main logic board. 3. Replace the printer software with known-good software. 4. Replace the printer interface cable. 5. Replace the power/sweep board (Classic) or the power supply (SE and SE/30).
Known-good LaserWriter® on an AppleTalk® network will not print	1. Make sure the Chooser indicates the LaserWriter icon and the correct LaserWriter. 2. Run ALL Apple TechStep Logic tests. If the SCC test fails, replace the main logic board. 3. Replace the printer software with known-good software. 4. For network troubleshooting, refer to the *Networks* tab in *Apple Service Technical Procedures*.

Miscellaneous Problems	**Action**
Clicking, chirping, or thumping sound	1. Verify that the main logic board power cable is securely attached to connector J12 on the main logic board. 2. Disconnect the hard drive power cable. If the noise disappears, replace the hard drive. 3. Disconnect the floppy drive. If the noise disappears, replace the floppy drive. 4. Disconnect the power cable from the main logic board. If the noise disappears, replace the main logic board. 5. Replace the power supply (SE and SE/30) or analog board (SE and SE/30). 6. Replace the power/sweep board (Classic).
No sound from speaker	1. Verify that the volume setting in the Sound area of the Control Panel is 1 or above. 2. Run ALL Apple TechStep Logic tests. If the Sound or VIA test fails, replace the main logic board. 3. Replace the speaker.
Smoke/odor	1. Replace the power supply (SE and SE/30) or the power/sweep board (Classic). 2. Replace the analog board (SE and SE/30).

"sad Macintosh" icon	1. If a known-good system disk boots, replace the disk.
	2. Run all the Apple TechStep Logic tests. If the SIMMs test fails on an SE or SE/30, replace the faulty SIMM(s); if the RAM test fails on a Classic, replace the faulty SIMM(s) or module(s). If any other test fails, replace the main logic board.
	3. Verify that the three-pin jumper or the two resistors on the main logic board correctly indicates the SIMMs installed (SE only).
	4. Verify that the three-pin jumper on the Classic memory expansion board correctly indicates *SIMMs* or *No SIMMS*.
"sad Macintosh" icon and black lines on screen; screeching sound	1. Verify that the three-pin jumper or the two resistors on the main logic board correctly indicates the SIMMs installed (SE only).
	2. Verify that the three-pin jumper on the Classic memory expansion board correctly indicates *SIMMs* or *No SIMMS*.
	3. Run the Apple TechStep RAM or SIMMs test. If the SIMMs test fails on an SE or SE/30, replace the faulty SIMM(s); if the RAM test fails on a Classic, replace the faulty SIMM(s) or module(s).
Control Panel clock resets after you switch the computer off	1. Replace the battery.
	2. Replace the main logic board.

Macintosh IIcx

System Problems
Computer does not
power on, screen is
black, fan doesn't
run, and LED is not lit

Action
1. Check cables.
2. Plug the monitor directly into a wall socket and verify that the monitor has power.
3. Replace the power cord.
4. Use Apple TechStep to measure the power-up voltage. If the voltage is below 3.0, replace the power supply.
5. Use Apple TechStep to measure the power supply voltage. If the voltage is below 4.8, replace the power supply.
6. Replace the logic board.

Screen is black;
audio and drive do
not operate, but
fan runs and
LED is lit

1. Run ALL Apple TechStep Logic tests. If the SIMMs test fails, replace the faulty SIMMs. If any other test fails, replace the logic board.
2. Use Apple TechStep to measure the power supply voltage. If the voltage is below 4.8, replace the power supply.

Computer intermittently
crashes or locks up

1. Make sure system software is version 6.0.7 or later.
2. Make sure all software is known-good.
3. Run ALL Apple TechStep Logic tests in looping mode. If the SIMMs test fails, replace the faulty SIMMs. If any other test fails, replace the logic board.
4. Use Apple TechStep to measure the power supply voltage. If the voltage is below 4.8, replace the power supply.

Computer shuts down intermittently	1. Make sure the air vents at the rear-top of the case are clear. Thermal protection circuitry may shut the computer down. After 30 to 40 minutes, the computer should run.
	2. Replace the power cable.
	3. Use Apple TechStep to measure the battery voltage. If the voltage is below 3.0, replace the battery.
	4. Use Apple TechStep to measure the power supply voltage. Replace the power supply if the voltage is below 4.8.
	5. Run all the Apple TechStep Logic tests. If the SIMMs test fails, replace the faulty SIMMs. If any other test fails, replace the logic board.
Computer intermittently does not power on	1. Check the computer cables.
	2. Plug the monitor directly into a wall socket and verify that the monitor has power.
	3. Try a known-good keyboard and ADB cable.
	4. Replace the power cord.
	5. Use Apple TechStep to measure the power-up voltage. If the voltage is below 3.0, replace the power supply.
	6. Unplug the power cord for 5–10 minutes. Replace the power cord and switch on the computer. If the computer boots normally, replace the power supply.
	7. Run ALL Apple TechStep Logic tests. If the SIMMs test fails, replace the faulty SIMMs. If any other test fails, replace the logic board.
Computer seems to boot; then message **Finder™ is old version** appears on computer screen	1. Use the Apple TechStep destructive P/RAM test to clear the parameter RAM. Restore the Control Panel settings when you finish.
	2. Replace the logic board.

Video Problems	**Action**
Screen is black, audio and drive OK, fan runs, and LED is lit	1. Adjust the brightness on the monitor.
	2. Replace the monitor.
	3. Replace the video cable.
	4. Move the video card to a different slot.
	5. Run the Apple TechStep Video (card) test. If the test fails, replace the defective video RAM or video card.
	6. Run ALL Apple TechStep Logic tests. If the SIMMs test fails, replace the faulty SIMMs. If any other test fails, replace the logic board.
	7. Use Apple TechStep to measure the power supply voltage. If the voltage is below 4.8, replace the power supply.
Partial or whole screen is bright and audio is OK, but no video information	1. Replace the monitor.
	2. Replace the video cable.
	3. Move the video card to a different slot.
	4. Run the Apple TechStep Video (card) test. If the test fails, replace the defective video RAM or video card.
	5. Run ALL Apple TechStep Logic tests. If the SIMMs test fails, replace the faulty SIMMs. If any other test fails, replace the logic board.

Floppy Drive Problems	**Action**
Audio and video OK, but internal floppy drive does not work	1. If a known-good disk works, replace the disk.
	2. Run ALL Apple TechStep Logic tests. If the SWIM test fails, replace the logic board.
	3. Run the Apple TechStep Drive test on the faulty drive. If the test fails, replace the drive cable.
	4. Replace the drive.
	5. Replace the power supply.

External drive does not work	1. If a known-good disk works, replace the disk.
	2. Run ALL Apple TechStep Logic tests. If the SWIM test fails, replace the logic board.
	3. Run the Apple TechStep Drive test on the drive. If the test fails, replace the drive.
Disk ejects; display shows icon with blinking **X**	1. Replace the disk with a known-good system disk.
	2. Run the Apple TechStep Drive test. If the test fails, replace the drive.
	3. Run ALL Apple TechStep Logic tests. If the SIMMs test fails, replace the faulty SIMMs. If any other test fails, replace the logic board.
Drive will not eject disk	1. Switch off the computer. Hold the mouse button down while you switch the computer on (to complete the eject cycle).
	2. Eject the disk manually by pushing an opened paper clip into the hole beside the drive.
	3. Run all the Apple TechStep Logic tests. If a test fails, replace the logic board.
	4. Run the Apple TechStep Drive test. If the test fails, replace the drive cable.
	5. Replace the drive.
Disk will not insert completely	1. Eject disk manually by pushing an opened paper clip into the hole beside the drive.
	2. Switch off the computer. Hold the mouse button down while you switch the computer on (to complete the eject cycle).
	3. Replace the drive.

Internal drive runs continuously	1. If a known-good disk works, replace the disk.
	2. Run the Apple TechStep Drive test. If the test fails, replace the drive.
	3. Run ALL Apple TechStep Logic tests. If a test fails, replace the logic board.
Drive attempts to eject disk but doesn't	1. Reinsert the disk.
	2. Eject the disk manually by pushing an opened paper clip into the hole beside the drive.
	3. Replace the drive.
SCSI Problems	**Action**
Internal hard drive will not work or spin; drive LED does not light	1. Verify that the drive and all other SCSI connections and terminations are proper.
	2. Run the Apple TechStep SCSI Bus Scan. If the scan can't find the hard drive, replace the hard drive power cable.
	3. Replace the hard drive.
Computer works with internal or external SCSI device but not both	1. Verify that no external device has a SCSI address of 0 (internal hard drive address) or 7 (CPU address). Also verify that all SCSI devices have unique SCSI addresses.
	2. Use the Apple TechStep SCSI Term Check to verify that SCSI termination is correct. If the check fails, replace the external terminator (if present). If the check still fails, replace the logic board.
	3. If the computer has an internal SCSI hard drive, verify that the drive has termination resistors.

Mouse and
Peripheral Problems   **Action**

Cursor does not   1. Reboot the system.
move   2. Check the mouse connection.
                         3. Clean the mouse.
                         4. If the mouse was connected to a keyboard,
                            connect the mouse directly to an ADB port.
                            If the mouse now works, replace the key-
                            board.
                         5. Run ALL Apple TechStep Logic tests. If the
                            ADB test fails, replace the logic board.
                         6. If the mouse does not work in either ADB
                            port, replace the mouse.

Cursor moves, but   1. Run ALL Apple TechStep Logic tests. If
clicking the mouse   the ADB test fails, replace the logic board.
button has no effect   2. Replace the mouse.

No response to any   1. Check the keyboard connection to the
key on the keyboard   computer ADB port.
                         2. Run ALL Apple TechStep Logic tests. If the
                            ADB test fails, replace the logic board.
                         3. Replace the keyboard cable.
                         4. Replace the keyboard.

Double-clicking will   1. Locate and remove extra system files.
not open a volume   2. Use the Apple TechStep P/RAM test
or application   (destructive mode) to clear the parameter
                            RAM. Restore the parameter RAM settings.
                         3. If the mouse was connected to a keyboard,
                            connect the mouse directly to an ADB port.
                            If the mouse works, replace the keyboard.
                         4. Run ALL Apple TechStep Logic tests. If the
                            ADB test fails, replace the logic board.
                         5. If the mouse fails in an ADB port, replace
                            the mouse.

Known-good ImageWriter will not print	1. Make sure the Chooser indicates the ImageWriter™ icon and the correct serial port.
	2. Run ALL Apple TechStep Logic tests. If the SCC test fails, replace the logic board.
	3. Replace the printer software with known-good software.
	4. Replace the printer interface cable.
	5. Replace the power supply.
Known-good LaserWriter on an AppleTalk network will not print	1. Make sure the Chooser indicates the Laser Writer icon and the correct LaserWriter.
	2. Run ALL Apple TechStep Logic tests. If the SCC test fails, replace the logic board.
	3. Replace the printer software with known-good software.
	4. For network troubleshooting, refer to the *Networks* tab in *Apple Service Technical Procedures*.

Miscellaneous Problems

	Action
Clicking, chirping, or thumping sound	1. Disconnect the hard drive. If the noise disappears, replace the drive.
	2. Disconnect the floppy drive. If the noise disappears, replace the drive.
	3. Replace the power supply.
	4. Replace the logic board.
No sound from speaker	1. Verify that the volume setting in the Sound area of the Control Panel is 1 or above.
	2. Run ALL Apple TechStep Logic tests. If a test fails, replace the logic board.
	3. Replace the speaker.
Control Panel clock resets after you switch the computer off	1. Replace the battery.
	2. Replace the logic board.

Macintosh II and IIx

System Problems
Computer does not
power on, screen is
black, fan doesn't
run, and LED is not lit

Action
1. Check the computer cables.
2. Plug the monitor directly into a wall socket
   and verify that the monitor has power.
3. Replace the power cord.
4. Use Apple TechStep to measure the battery
   voltage. If the voltage is below 3.0, replace
   both batteries.
5. Use Apple TechStep to measure the power
   supply voltage. If the voltage is below 4.8,
   replace the power supply.
6. Replace the logic board.

Screen is black;
audio and drive do
not operate, but
fan runs and
power-on LED is lit

1. Run ALL Apple TechStep Logic tests. If
   the SIMMs test fails, replace the faulty
   SIMMs. If the ROMck test fails, isolate and
   replace the defective ROM (Macintosh II)
   or ROM SIMM (Macintosh IIx). If any other
   test fails, replace the logic board.
2. Use Apple TechStep to measure the power
   supply voltage. If the voltage is below 4.8,
   replace the power supply.

Computer intermittently
crashes or locks up

1. Make sure the system software is version
   6.0.7 or later.
2. Make sure all software is known-good.
3. Run ALL Apple TechStep Logic tests in
   looping mode. If the SIMMs test fails, re-
   place the faulty SIMMs. If the ROMck test
   fails, replace the defective ROM (Macintosh
   II) or ROM SIMM (Macintosh IIx). If any
   other test fails, replace the logic board.
4. Use Apple TechStep to measure the power
   supply voltage. If the voltage is below 4.8,
   replace the power supply.

Computer shuts down intermittently	1. Make sure the air vents on sides and top of the case are clear. Thermal protection circuitry may shut down the computer. After 30 to 40 minutes, the computer should be OK. 2. Replace the power cord. 3. Use Apple TechStep to measure the battery voltage. If the voltage is below 3.0, replace both batteries. 4. Use Apple TechStep to measure the power supply voltage. If the voltage is below 4.8, replace the power supply. 5. Run all the Apple TechStep Logic tests in looping mode. If the SIMMs test fails, replace the faulty SIMMs. If any other test fails, replace the logic board.
Computer intermittently does not power on	1. Check the computer cables. 2. Plug the monitor directly into a wall socket and verify that the monitor has power. 3. Try a known-good keyboard and ADB cable. 4. Replace the power cord. 5. Use Apple TechStep to measure the battery voltage. If the voltage is below 3.0, replace both batteries. 6. Run ALL Apple TechStep Logic tests in looping mode. If the SIMMs test fails, replace the faulty SIMMs. If the ROMck test fails, replace the defective ROM (Macintosh II) or ROM SIMM (Macintosh IIx). If any other test fails, replace the logic board.
Computer seems to boot; then message **Finder is old version** appears on computer screen	1. Use the Apple TechStep destructive P/RAM test to clear the parameter RAM. Restore the Control Panel settings when you finish. 2. Replace the logic board.

Video Problems

Screen is black,
audio and drive
operate, fan runs,
and LED is lit

Action

1. Adjust the brightness on the monitor.
2. Replace the monitor.
3. Replace the video cable.
4. Move the video card to a different slot.
5. Run the Apple TechStep Video (card) test.
   If the test fails, replace the defective video
   RAM or video card.
6. Run ALL Apple TechStep Logic tests. If the
   SIMMs test fails, replace the faulty SIMMs.
   If the ROMck test fails, replace the defec-
   tive ROM (Macintosh II) or ROM SIMM
   (Macintosh IIx). If any other test fails, re-
   place the logic board.
7. Use Apple TechStep to measure the power
   supply voltage. If the voltage is below 4.8,
   replace the power supply.

Partial or whole
screen is bright and
audio is OK, but
no video information

1. Replace the monitor.
2. Replace the video cable.
3. Move the video card to a different slot.
4. Run the Apple TechStep Video (card) test.
   If the test fails, replace the defective video
   RAM or video card.
5. Run ALL Apple TechStep Logic tests. If the
   SIMMs test fails, replace the faulty SIMMs.
   If the ROMck test fails, replace the defec-
   tive ROM (Macintosh II) or ROM SIMM
   (Macintosh IIx). If any other test fails, re-
   place the logic board.

**Floppy
Drive Problems**

Action

Audio and video OK,
but internal drive
does not work

1. If a known-good disk works, replace the
   disk.
2. Run ALL Apple TechStep Logic tests. If
   the SWIM test fails, replace the logic board.
3. Run the Apple TechStep Drive test on the
   faulty drive. If the test fails, replace the
   drive cable.
4. Replace the drive.
5. Replace the power supply.

Audio and video
OK, but neither
internal drive works

1. If a known-good disk works, replace the
   disk.
2. Run ALL Apple TechStep Logic tests. If
   the SWIM/IWM test fails, replace the logic
   board.
3. Replace the power supply.
4. Replace the logic board.

Disk ejects; display
shows icon with
blinking **X**

1. Replace the disk with a known-good sys-
   tem disk.
2. Run the Apple TechStep Drive test. If the
   test fails, replace the drive.
3. Run ALL Apple TechStep Logic tests. If the
   SIMMs test fails, replace the faulty SIMMs.
   If the ROMck test fails, replace the defec-
   tive ROM (Macintosh II) or ROM SIMM
   (Macintosh IIx). If any other test fails, re-
   place the logic board.

Drive will not eject disk

1. Switch off the computer. Hold the mouse
   button down while you switch the comput-
   er on (to complete the eject cycle).
2. Eject disk manually by pushing an opened
   paper clip into the hole beside the drive.
3. Run all the Apple TechStep Logic tests. If a
   test fails, replace the logic board.
4. Run the Apple TechStep Drive test. If the
   test fails, replace the drive cable.
5. Replace the drive.

Disk will not insert completely	1. Eject disk manually by pushing an opened paper clip into the hole beside the drive. 2. Switch off the computer. Hold the mouse button down while you switch the computer on (to complete the eject cycle). 3. Replace the drive.
Internal drive runs continuously	1. If a known-good disk works, replace the disk. 2. Run the Apple TechStep Drive test. If the test fails, replace the drive. 3. Run ALL Apple TechStep Logic tests. If the SIMMs test fails, replace the faulty SIMMs. If the ROMck test fails, replace the defective ROM (Macintosh II) or ROM SIMM (Macintosh IIx). If any other test fails, replace the logic board.
Drive attempts to eject disk but doesn't	1. Reinsert the disk. 2. Reseat the top cover so the cover drive slot aligns correctly with the drive. 3. Eject the disk manually by pushing an opened paper clip into the hole beside the drive. 4. Replace the drive.

SCSI Problems	**Action**
Internal hard drive will not work or spin; drive LED does not light	1. Verify that the drive and all other SCSI connections and terminations are proper. 2. Run the Apple TechStep SCSI Bus Scan. If the scan can't find the hard drive, replace the hard drive power cable. 3. Replace the hard drive.
Computer works with internal or external SCSI device but not both	1. Verify that no external device has a SCSI address of 0 (internal hard drive address) or 7 (CPU address). Also verify that all SCSI devices have unique SCSI addresses. 2. Use the Apple TechStep SCSI Term Check to verify that SCSI termination is correct. If the check fails, replace the external terminator (if present). If the check still fails, replace the logic board. 3. If the computer has an internal SCSI hard drive, verify that the drive has termination resistors.

Mouse and Peripheral Problems	**Action**
Cursor does not move	1. Reboot the computer. 2. Check the mouse connection. 3. Clean the mouse. 4. If the mouse was connected to a keyboard, connect the mouse directly to an ADB port. If the mouse now works, replace the keyboard. 5. Run ALL Apple TechStep Logic tests. If the ADB test fails, replace the logic board. 6. If the mouse does not work in either ADB port, replace the mouse.
Cursor moves, but clicking the mouse button has no effect	1. Run ALL Apple TechStep Logic tests. If the ADB test fails, replace the logic board. 2. Replace the mouse.

No response to any key on the keyboard	1. Check the keyboard connection to the computer ADB port. 2. Run ALL Apple TechStep Logic tests. If the ADB test fails, replace the logic board. 3. Replace the keyboard cable. 4. Replace the keyboard.
Double-clicking will not open a volume or application	1. Locate and remove extra system files. 2. Use the Apple TechStep P/RAM test (destructive mode) to clear the parameter RAM. Restore the parameter RAM settings. 3. If the mouse was connected to a keyboard, connect the mouse directly to an ADB port. If the mouse works, replace the keyboard. 4. Run ALL Apple TechStep Logic tests. If the ADB test fails, replace the logic board. 5. If the mouse fails in an ADB port, replace the mouse.
Known-good ImageWriter will not print	1. Make sure the Chooser indicates the ImageWriter icon and the correct serial port. 2. Run ALL Apple TechStep Logic tests. If the SCC test fails, replace the logic board. 3. Replace the printer software with known-good software. 4. Replace the printer interface cable. 5. Replace the power supply.
Known-good LaserWriter on an AppleTalk network will not print	1. Make sure the Chooser indicates the Laser Writer icon and the correct LaserWriter. 2. Run ALL Apple TechStep Logic tests. If the SCC test fails, replace the logic board. 3. Replace the printer software with known-good software. 4. For network troubleshooting, refer to the *Networks* tab in *Apple Service Technical Procedures*.

Miscellaneous Problems

Problems	Action

Clicking, chirping, or thumping sound

1. Disconnect the hard drive. If the noise disappears, replace the drive.
2. Disconnect the floppy drive. If the noise disappears, replace the drive.
3. Replace the power supply.
4. Replace the logic board.

No sound from speaker

1. Verify that the volume setting in the Sound Control Panel is 1 or above.
2. Run ALL Apple TechStep Logic tests. If a test fails, replace the logic board.
3. Replace the speaker.

Control Panel clock resets after you switch the computer off

1. Use Apple TechStep to measure the battery voltage. If the voltage is below 6.0, replace both batteries.
2. Replace the logic board.

HMMU socket does not allow PMMU installation

- Replace the logic board. Verify that the HMMU/PMMU socket on the replacement logic board is a 13 x 13 grid array package and that it contains 132 gold contacts inside the socket. (Sockets containing 70 pins do not support PMMU.)

SCSI HD Tests

SCSI HD Tests includes information on using the Apple TechStep *SCSI HD Tests* ROM pack to test and troubleshoot Apple SCSI hard disk drives. This chapter includes test descriptions, test instructions, and setup procedures.

Introduction

**What This ROM
Pack Supports**

This ROM pack supports the following Apple
SCSI hard disk drives:

■ Internal 20 SC, 40 SC, 80 SC, and 160 SC
drives

■ External HD 20 SC, HD 40 SC, HD 80 SC,
and HD 160 SC drives

**Things to
Remember**

■ Use the AC adapter. Bad Block Scan and
All Sk & Scan (which includes the Bad
Block Scan) each takes approximately 2
minutes per megabyte. A 40-megabyte
drive takes approximately 20 minutes; a
160-megabyte drive approximately one
and a half hours. Other HD Tests (Random
Sk/Rd, In/Ex/Rndm Sk, Write test, and HD
self-test) take one to five minutes each.

■ If the hard drive under test is attached to a
Macintosh, place the Macintosh in Test
Manager mode before using the SCSI HD
tests. Refer to "tstMd – Test Manager Mode"
under "CPU Tests and Functions" in Chap-
ter 1, CPU Tests.

**Troubleshooting
Hints**

When selecting tests, keep in mind the follow-
ing guidelines.

■ The Bad Block Scan is the only test that
reads every block on the drive. For more-
complete testing, also run the Random Sk/
Rd test. For complete testing, run the All Sk
& Scan tests.

- If you need to save time, run just the Random Seek test. This test reads a percentage of blocks on the disk in a random order, thereby verifying that the drive's seek mechanism functions properly.

- Running the Write test and Check & Fix tests could destroy data. Although the tests are nondestructive, a defective drive could destroy data. **Before running the Write test or any Check & Fix test, always back up the data on the drive.** If the drive is defective, data may alter. If backing up the drive is not possible, inform the customer **beforehand** that data may disappear.

Connecting Apple TechStep

This section covers connecting Apple Tech-Step (with the *SCSI HD Tests* ROM pack) to a Macintosh computer or to an external SCSI hard disk drive.

▲ Caution

Always switch off Apple TechStep and the Macintosh computer before you connect cables.

Connecting Cables

To connect directly to an external SCSI hard disk drive (not attached to a Macintosh computer), connect the cables as in Figure 3-1. Use a standard SCSI System Cable to connect Apple TechStep to the drive's SCSI port. Install a SCSI Cable Terminator on the second SCSI connector of the drive. If a SCSI Cable Terminator is not available, you can use the Apple TechStep SCSI SCSI Term function. Refer to "SCSI Term – SCSI Termination On/Off" for instructions.
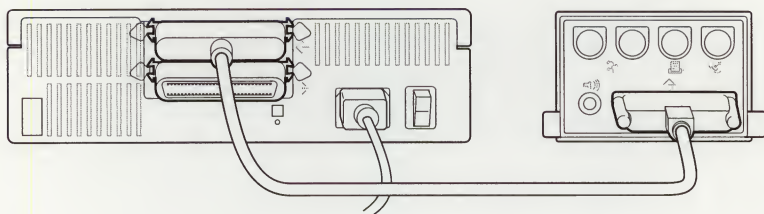
Figure 3-1   **External Hard Disk Drive**

For CPUs with an internal hard drive, connect the cables as in Figure 3-2. Use the Apple TechStep SCSI cable to connect Apple TechStep to the computer SCSI port. (Connect the ADB cable to the ADB 1 port on Apple TechStep if the computer is a Macintosh Classic.)

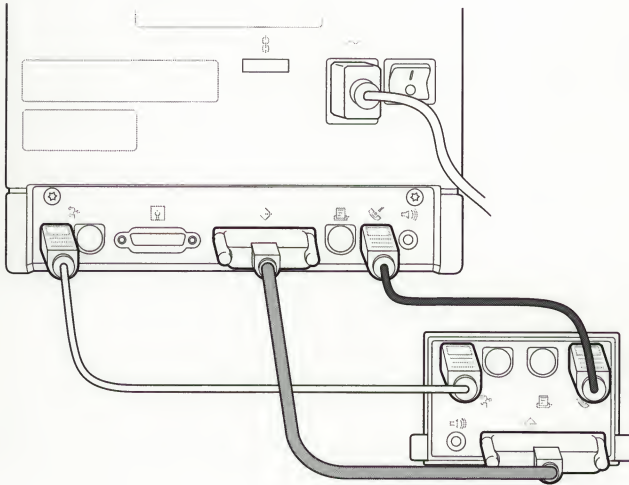❖ Note   Place the Macintosh in Test Manager mode before you run tests.

Figure 3-2   **Macintosh with an Internal SCSI Hard Disk Drive**

For CPUs without an internal hard drive, you must switch on the Apple TechStep SCSI termination function. Refer to "SCSI Term – SCSI Termination On/Off" for instructions.

❖ Note   If the SCSI bus termination is incorrect, the hard drive tests will not function correctly.

For CPUs with external SCSI devices, connect the cables as in Figure 3-3. Use a standard SCSI System Cable to connect Apple TechStep to the last SCSI device. The last device on the chain must have a SCSI Cable Terminator. If a SCSI terminator is not available, you can switch on the Apple TechStep SCSI termination function. Refer to "SCSI Term – SCSI Termination On/Off" for instructions.

❖ Note   If the SCSI bus termination is incorrect, the hard drive tests will not function correctly.
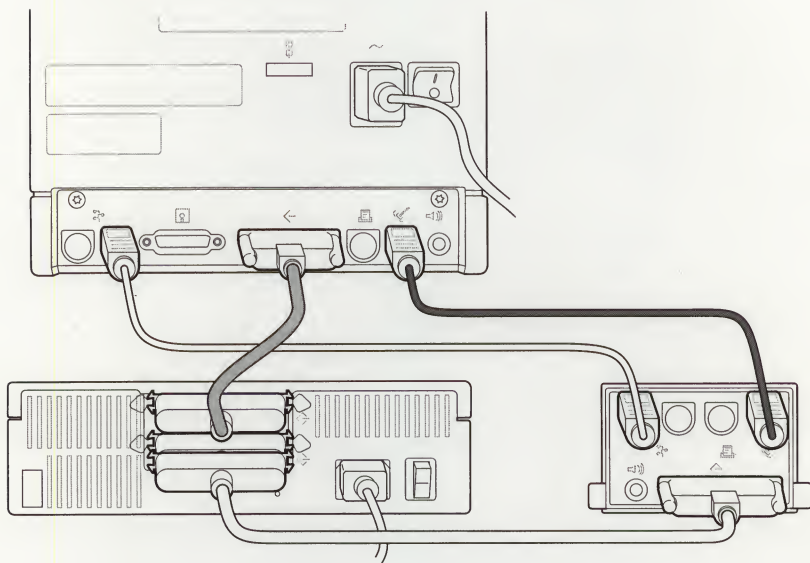

Figure 3-3   **Macintosh with External SCSI Devices**

SCSI HD Tests and Functions

This section describes the tests and functions in the *SCSI HD Tests* ROM pack.

Before You Start

Before you begin testing, refer to "Connecting Apple TechStep" for setup information.

If you are testing an internal hard disk or an external hard disk attached to a Macintosh computer, first place the computer in Test Manager mode. For instructions on invoking the Test Manager, refer to "tstMd – Test Manager Mode" under "CPU Tests and Functions" in Chapter 1, CPU Tests. Placing the computer in Test Manager mode ensures that the computer does not use the SCSI bus and that the bus will be noiseless during testing.

☛ Tip

The SCSI functions are also available in the *CPU Tests, Volume 1* ROM pack. Only the HD Check and HD Check & Fix tests are unique to the *SCSI HD Tests* ROM pack.

SCSI Term Powr – SCSI Termination Power Measurement

The SCSI Term Powr function measures and displays the termination voltage on the SCSI bus. The voltage ranges from 0 to 5.0 volts. Apple TechStep indicates whether the termination power is LO, OK, or HI, as follows:

LO – 0 to 4.14 volts
OK – 4.15 to 5.24 volts
HI – 5.25 volts or above

A blown fuse or diode on the logic board can cause insufficient voltage. Connecting or disconnecting the SCSI cable while the Macintosh computer or an external device has power can blow the fuse or diode.

Figure 3-4 shows a sample measurement.

```
SCSI  HD
SCSI  Term  Power
Actual=4.76:  OK
Normal=>4.16v
```

Figure 3-4 **SCSI Termination Power**

To measure the SCSI termination voltage:

1. Switch on all devices attached to Apple TechStep.

2. Select **SCSI Term Powr** from the menu.

❖ Note   To properly measure SCSI termination power, switch on all devices on the SCSI bus.

SCSI Term Chk – SCSI Termination Check

This test checks the SCSI bus to see whether termination is correct. Figure 3-5 shows a sample test result.

```
SCSI  HD
SCSI  Term  Check
Test  PASSED
```

Figure 3-5 **SCSI Termination Check**

To perform a SCSI termination check:

1. Switch on all devices attached to Apple TechStep.

2. Verify that the Apple TechStep SCSI Term function is OFF. (If the Apple TechStep SCSI Term function is on, SCSI Term Chk will always pass.)

3. Select **SCSI Term Chk** from the menu.

The test indicates **PASSED** or **FAILED**. If the check fails, verify the SCSI termination. (Internal SCSI hard disk drives should have terminator resistor packs. If external SCSI devices are attached, the last device on the daisy chain should have an external Apple SCSI Cable Terminator.

❖ Note   To check SCSI termination, switch on all devices on the SCSI bus.

☛ Tip   If you must terminate the SCSI bus for testing purposes only, switch on the Apple TechStep SCSI termination feature. See "SCSI Term – SCSI Termination On/Off."

SCSI Bus Scan

The SCSI bus scan examines the SCSI bus, builds a table of SCSI devices, and displays a menu of these devices, as Figure 3-6 shows.

```
SCSI  Bus  Scan
TS=6;  devices  at
ID#s:  0-------
Info:  Press  ID#
```

Figure 3-6 **SCSI Bus Scan**

In Figure 3-6, **TS** indicates the current SCSI ID of Apple TechStep. The SCSI IDs of SCSI devices appear on the third line. To display information about a device, press the number of the device.

```
ID#0  ROMv:2.30
CONNER  DISK
SR#E0C4XW
CP3040A-40mb-3.5
```

Figure 3-7 **SCSI Device Information**

Figure 3-7 shows a sample SCSI device information screen. If the device is a hard drive, Apple TechStep displays the ROM version, manufacturer, serial number (not available for all drives), product number, and drive size (not available for all drives). If the device is an Apple product, an Apple (🍎) appears in the first position of line 2.

❖ Note   There are two types of SCSI device: initiators and targets. Initiators can initiate messages as well as receive and respond; targets can only receive and respond. The Macintosh computer and Apple TechStep are initiators; hard disks, printers, CD ROMs, scanners, and other peripherals are targets.

The SCSI Bus Scan shows only SCSI target devices. Initiators, such as the Macintosh computer and Apple TechStep, do not appear on the SCSI Bus Scan screen. If you choose a SCSI ID number that an initiator occupies or that doesn't correspond to a device, the following dialog screen appears:

```
NO  SCSI  TARGET
DEVICE  FOUND  AT
THAT  SCSI  ID#
(Press  BACK)
```

❖ Note   Before you run a SCSI Bus Scan of a chain that includes a switched-on Macintosh computer, place the Macintosh in Test Manager mode. (If the Macintosh computer is not in Test Manager mode, the computer could send commands on the SCSI bus while tests are running and thus invalidate results.)

HD Check and HD Check & Fix – Hard Drive Tests

You can run all Apple TechStep hard drive tests in two modes—Check and Check & Fix.

In Check mode, Apple TechStep will spare a block only if Apple TechStep can recover the data from that block (just as a hard drive spares blocks in normal operation, invisibly to the user). If you are absolutely forbidden to change data on the disk, use Check mode. All Check mode tests will stop when they find a bad block of data that Apple TechStep cannot recover. However, if you cannot mount the disk by any means, Check & Fix mode may be your only hope for mounting the drive so that you can recover at least some of the data.

In Check & Fix mode, Apple TechStep attempts to spare bad blocks, even if Apple TechStep cannot recover the data on the block. Check & Fix may enable you to mount a previously unmountable disk so that you may recover some data by using standard recovery methods, such as Symantec Utilities for the Macintosh™, Norton Utilities®, or PC Tools™ Deluxe. However, you may lose data in the process: if Apple TechStep spares a block but can't recover the data, the disk has a hole where that data should be. Use Check & Fix mode as a last resort—if you can't mount the drive and recover data by any other means.

HD Check and **HD Check & Fix** each contain a submenu of seven choices:

- Change Target

- Random Sk/Rd

- In/Ex/Rndm Sk

- Write test

- HD self-test

- Bad Block Scan

- ALL Sk & Scan

If you select **HD Check & Fix**, the dialog screen in Figure 3-8 appears.

```
WARNING: FIX
may alter data!
1-Continue
2-Cancel
```

Figure 3-8   **Check and Fix Dialog**

If you want to continue, press *1*. To abort and return to the menu, press *2*.

In the Check and Check & Fix menus, the following menu choices appear.

Change Target
The Change Target selection enables you to choose the SCSI ID number of the drive you wish to test. The Dialog screen in Figure 3-9 appears.

```
Enter  SCSI  ID#  of
HD  to  test:  0
(AplTchStp  =  6)
↓=accept;bk=cncl
```

Figure 3-9   **Change Target Dialog**

Random Sk/Rd – Random Seek & Read Test
This test causes the hard drive read/write heads to seek 512 blocks at random and to attempt to read the addresses. This test exercises the head-positioning mechanism and verifies the drive's ability to position the read/write heads at a desired track and sector (block).

In/Ex/Rndm Sk – Interior/Exterior/Random Seek Test
This three-part seek test exercises the read/write head-positioning mechanism of the disk drive. The Interior Seek test searches for the drive's interior track from locations progressively nearer the outside of the disk. The Exterior Seek test searches for the drive's exterior track from locations progressively nearer the center of the disk. The Random Seek test checks the drive's ability to search for random blocks on the disk. Each test verifies the drive's ability to position the read/write head at the correct track and sector (block).

If the mechanism is faulty, the head will not accurately find the intended block, and Apple TechStep receives an error message.

Write test

The Write test attempts to write data to 512 randomly selected blocks, read the data, and compare the two. This test exercises the drive's write mechanism. If the test fails, use *HD SC Setup* to reformat the drive and retest. If the drive still fails, replace the drive. You should run the Write test if the drive generates write errors.

▲ Caution

Always back up the data on the drive before you run the Write test. The Write test reads the block of data, inverts it, and writes it to the same address; then the test reads the block of data again, inverts the block once more, and writes it back to the same address. This process should restore the original data to the address. However, if the drive is defective, the Write test may alter data.

HD Self-Test

The HD self-test initiates the hard drive internal power-on self-test. The power-on self-test provides a quick check of the drive's electronics. However, do not use this test in place of the Bad Block Scan or the Random Sk/Rd, In/Ex/Rndm Sk, and Write tests.

If the power-on self-test finds an error, the drive self-test stops and sends the results to Apple TechStep. (See "Error Codes and What They Mean.")

Bad Block Scan

The Bad Block Scan sequentially reads every block on the disk, from the highest to the lowest logical block address. If a block address or data is faulty, the test will attempt to transfer the data on the block to a good block (see "Sparing Blocks").

The Bad Block Scan is the most comprehensive check of the disk media, but by itself this scan does not exercise the head-positioning mechanism as vigorously as do the Seek tests. To thoroughly test the drive, run the Bad Block Scan and the Seek tests.

The Bad Block Scan takes approximately two minutes per megabyte.

If you continue to have difficulty with the drive after running the Bad Block Scan, use *HD SC Setup* to reformat the drive. If reformatting fails, replace the drive.

All Sk & Scan – All Seek & Scan Tests

This selection runs the Bad Block Scan, the Random Sk/Rd test, and the In/Ex/Rndm Sk test. This is the single most comprehensive choice on the Apple TechStep SCSI HD test menu.

SCSI Term – SCSI Termination On/Off

This function allows you to use Apple Tech-Step to supply an active termination path for the SCSI bus if no physical terminator is available (if you are working on a CPU with no hard disk, for example). You can also use SCSI Term to verify a faulty SCSI terminator.

❖ Note   The Apple TechStep SCSI Termination function requires the Macintosh or an external SCSI device to supply termination power. (The Macintosh Classic, SE, SE/30, II, IIx, and IIcx all provide termination power.)

❖ Note   When you switch on Apple TechStep, SCSI Term defaults to OFF. This default prevents Apple TechStep from masking problems with the UUT SCSI bus termination.

Selecting **SCSI Term** will toggle the Apple TechStep termination on and off. The termination status appears on screen after the function name.

AplTS SCSI # – Set Apple TechStep SCSI ID

In order to talk on the bus without causing data collisions, every device on a SCSI bus must have a unique SCSI device address (ID). Apple TechStep assigns itself a default SCSI device address of 6 whenever you switch on Apple TechStep. If another device on the SCSI bus already has address 6, use AplTS SCSI# to change the Apple TechStep address to any other legal SCSI address (0 – 7).

Figure 3-10 shows a sample screen.

```
Apple  TechStep
SCSI  ID#  is:  6
Enter  new  ID  #,
↓=accept;bk=cncl
```

Figure 3-10 **Setting the TechStep SCSI ID**

Enter the new ID number and press the *down* arrow (↓). This ID will remain the default ID number until you switch off Apple TechStep. (Changing the active ROM pack does not affect the setting.) Switching off Apple TechStep resets the SCSI ID number to 6.

❖ Note   The factory sets every Macintosh computer to SCSI address 7, so if you connect Apple Tech-Step to a CPU, do not assign address 7 to Apple TechStep.

SCSI Bus Reset

This function resets all devices on the SCSI bus. Resetting the SCSI bus places the bus in a power-up state.

Figure 3-11 shows a sample screen.

```
SCSI  HD
SCSI  Bus  Reset
Reset  Complete
```

Figure 3-11 **SCSI Bus Reset**

Sparing Blocks

All hard drives have occasional bad data blocks. Bad blocks are areas of the disk that are unusable because of scratches on the disk surface, data corruption, etc. When a drive finds a faulty block, the drive normally transfers the data to a good block and records the old block in a Spares Table or defect list. This

process, called *sparing*, allows the drive to correct for errors as it goes, without the user's noticing problems. However, when the Spares Table is full, the drive can no longer deal with block failures. You must reformat or replace the drive.

Both Check and Check & Fix modes of the Apple TechStep HD tests will spare blocks if the drive can transfer the data to new blocks without loss of integrity. If a Check test finds a block that contains unrecoverable data, the Check test will stop and report **Check FAIL** because the test can do no more. The Fix mode, in contrast, will spare this block, even though the Fix mode cannot recover the data. In some cases, sparing such a block will enable you to mount a previously unmountable disk. Sparing will create a hole in the file that contained the bad block; inform the customer **beforehand** that data may disappear. If the Fix test spares unrecoverable blocks, you will see the message **SomeDataAltered**.

Check and Check & Fix mode tests will stop when the Spares Table is full. At that point, you must reformat or replace the drive.

Error Codes and What They Mean

Error codes in Check mode and Check & Fix mode have the following format:

```
Ck&Fix,  ID#0
Bad  Block  Scan

B1123456  Er:0331
```

Figure 3-12 **SCSI Error Code**

In Figure 3-12, **Bl123456** is the number of the block at which the test found an error. **0031** is a SCSI error code consisting of two bytes of information from the test—the *sense byte* and the *extended sense byte*. The sense byte indicates the category of the failure—such as media, hardware, or a recovered error. Two important sense byte values are 03 (medium error) and 04 (hardware error).

A *medium error* indicates a data fault or a defect in the disk surface.

A *hardware error* indicates a fault of the drive mechanism or controller PCA.

Sense Byte	Extended Sense Byte	Fault
03	15	Seek positioning error
03	16	Data synchronizing mark error
03	19	Defect list error
03	1E	Recovered ID with target's ECC correction
03	31	Medium format corruption
04	08	Logical-unit communication failure
04	09	Track-following error
04	15	Seek-positioning error
04	41	Data path diagnostic failure
04	42	Power-on diagnostic failure
04	44	Internal controller error
04	47	SCSI interface parity error

Table 3-1 **SCSI Device Error Codes**

❖ Note   The Apple TechStep test log does not save error codes.

Looping SCSI HD Tests

When you suspect intermittent problems, you may want to run the SCSI HD Tests in looping mode. (As always, use the AC adapter if you intend to run the tests for an extended time.) In looping mode, error codes will not appear.

In Check mode, a looping test will run until you press the *stop* key. The **Err** counter updates every time the test encounters an unrecoverable bad block. When the Check test cannot perform a normal spare operation (i.e., the Spares Table is full), the test will stop automatically.

In Fix mode, a looping test will run until you press the *stop* key, or until Apple TechStep encounters a block that it cannot spare (the inability to spare usually means that the Spares Table is full). Unlike Check mode tests, tests in the Fix mode do not count blocks whose data Apple TechStep cannot recover—the FIX tests simply go ahead and spare unrecoverable blocks. Therefore, the error counter on the FIX test should never read anything but **0** unless the drive Spares Table is full—in which case the test will stop.

Release Notes

HD Check & Fix Tests

When you run an HD Check & Fix mode test, the tests may spare blocks that the test could not recover. If sparing occurs and the data isn't recovered, **SomeDataAltered** appears on the fourth line of the Test Results screen.

If Apple TechStep spared no blocks (except blocks whose data could be recovered), the message **No Data Altered** appears on the fourth line.

- The indicator for this message remains active until you return to the HOME menu or use the Change Target function. Therefore, if one test alters data, you will see the **SomeDataAltered** message on every Check & Fix mode test (regardless of whether the subsequent tests alter data) until you use the Change Target function or return to the HOME menu.

- The **SomeDataAltered** message appears only when you run single tests (Write test, Bad Block Scan, or Rndm Sk/Rd test) in nonlooped mode. If you run a looped test or grouped tests (ALL Sk & Scan or In/Ex/ Rndm Sk), the message does not appear. However, because the **SomeDataAltered** message remains in Apple TechStep, the message reappears when you start a non-looped single test and then press *stop*.

- The **SomeDataAltered** message does not apply to the HD self-test—that test reads results from the hard drive internal self-test and does not alter data, even in Check & Fix mode.

Appendix

The Appendix glossary defines terms that appear in this guide.

Glossary

Block – A 512-byte sector of data.

Block number – A function of the track and sector location.

HDA – Hard Disk Assembly. Includes the hard disk platters and spindle motor, read/write head and positioning motor, controller board, and metal enclosure.

Sense byte – The portion of the SCSI error code that indicates the type of failure (media, hardware, or recoverable).

Sparing – The process of transferring data from a defective block to a good block and recording the defective block in the Spares Table.

The Apple Service Technical Publications department used Apple Macintosh computers to write, edit, and format this Troubleshooting Guide. The application software was Frame Technology FrameMaker®, Adobe Illustrator®, and Microsoft® Word. Apple LaserWriter II printers created the proof pages. A Linotronic® 300 produced the final pages.